Rancho La Costa Habitat Conservation Area
Management Plan

2011-2015

Prepared for:

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Table of Contents

Tables

Figures

Appendices

I. Introduction

A. Background

The Rancho La Costa Habitat Conservation Area (HCA or Preserve) is an over 1,400 acre open space area set aside by the Real Estate Collateral Management Company (RECMC), Brookfield Homes, and Scandia Development as mitigation for impacts to natural habitat as part of the Villages of La Costa, University Commons, and Cassia Professional Offices (Cassia) developments. The Nelson parcel that was donated by the National Fish and Wildlife Foundation (NFWF) is also part of the HCA and most recently, the Meadowlark Parcel, a former property owned by The Environmental Trust (TET) is now part of the HCA. The HCA limits have been approved by the United States Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) with the primary goal of protecting habitat of the federally listed coastal California gnatcatcher (*Polioptila californica californica*) (CAGN), as well as other listed species, and numerous sensitive plant and wildlife species that are covered under the Fieldstone Habitat Conservation Plan (HCP) (Fieldstone, 1995), the draft City of San Marcos' Multiple Habitat Conservation Program (MHCP) Subarea Plan (San Marcos, 2001) and Carlsbad's Habitat Management Plan (HMP) (City of Carlsbad, 2004).

B. Habitat Conservation Area History

The Rancho La Costa HCA resulted from over ten years of effort that evolved into a unique planning process for a project specific plan, characterized by a consideration of range-wide conservation issues, open public participation and negotiations with conservation interests and federal, state and local agencies. The biological significance of the HCA comes from its location in relation to other important open space lands nearby. The eastern HCA areas form the western tip of the largest, contiguous stretch of coastal sage scrub and natural open space in northern San Diego County, and is the primary link between the City of Carlsbad's and San Marcos' natural communities and the larger regional ecosystem in the City of Escondido and San Diego County.

The Center for Natural Lands Management (CNLM) holds fee title to most parcels (with one remaining to be transferred), and is also managing properties pursuant to six recorded conservation easements (CE). CNLM will soon be in escrow for the last parcel. The developer, RECMC, had not transferred fee title to this last parcel so they could work out easement issues prior to transfer. These issues have since been resolved and escrow will commence prior to the end of 2011. Non-wasting endowments to manage all of the HCA parcels in perpetuity have been received. Management commenced in January 2002 for about one half of the total property with management of the additional acreage commencing between January 2002 and early 2009.

The HCA covers several areas which were dedicated to CNLM for long-term management from the La Costa Villages, University Commons, and Cassia developments. Each development dedicated several parcels that have been identified in the past by various names or associations (Table 1). Each Assessor Parcel Number (APN) can be located using the San Diego County Geographic Information System (SanGIS) parcel database and an ESRI ArcView program. The La Costa Villages project dedicated areas referred to as the Oaks, Ridges, Greens, Choumass-Pappas, and Alemere, of which the former three are located in the City of Carlsbad, and the latter two are located in the County of San Diego. The University Commons project dedicated areas referred to as the "on-site parcels", Frank's Peak, Pfau (CE), Huff, Wilern, Winston, Setter, and Elfin Forest (CE). The Elfin Forest areas are located both on-site (San Marcos) and within the County of San Diego. The Setter parcel is within the County of San Diego. All the other University Commons parcels are located within the City of San Marcos. The Nelson parcel, located in San Diego County, was purchased by the NFWF and deeded to CNLM. The Cassia parcel was added in 2007 and is located adjacent to the Greens parcel in Carlsbad. The Meadowlark parcel was added via the TET bankruptcy in early 2009 and is located in the City of San Marcos between the Wilern and on-site University Commons parcels.

Table 1: HCA Parcel Information

Parcel Name	Fee or CE Property	Development that Contributed the Parcel and Developer ( )	Jurisdiction of the Parcel and the Sub-area Plan that is Credited With its Habitat ( )
La Costa Oaks	Fee	La Costa Villages (RECMC)	Carlsbad (Carlsbad)
La Costa Ridges	Fee	La Costa Villages (RECMC)	Carlsbad (Carlsbad)
La Costa Greens	Fee	La Costa Villages (RECMC)	Carlsbad (Carlsbad)
Choumass-Pappas	Fee	La Costa Villages (RECMC)	County of San Diego (Carlsbad)
Alemere	Fee	La Costa Villages (RECMC)	County of San Diego (Carlsbad)
Winston	Fee	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Huff	Fee	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Brouwer	Fee	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Setter	Fee	University Commons (Brookfield Homes)	County of San Diego (San Marcos)
U.C. on-site and Lot 8 Easement	Fee and CE	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Wilern	Fee	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Frank's Peak and Pfau Easement	Fee and CE	University Commons (Brookfield Homes)	San Marcos (San Marcos)
Elfin Forest	CE	University Commons (Scandia)	County of San Diego (San Marcos)
Nelson	Fee	National Fish and Wildlife Foundation Purchase	County of San Diego (Carlsbad)
Cassia	Fee	Cassia Professional Offices	Carlsbad (Carlsbad)
TET Meadowlark	Fee	Meadowlark Estates	San Marcos (San Marcos)

Since management began in 2002 the majority of the non-native, perennial plant species, such as pampas grass (*Cortaderia selloana*), myoporum (*Myoporum laetum*), acacia (*Acacia* spp.), fountain grass (*Pennisetum setaceum*), tree tobacco (*Nicotiana glauca*), ice plant (*Carpobrotu*s spp.), and fennel (*Foeniculum vulgare*), each have been controlled to a level of less than one percent coverage (by area); however, ongoing treatments for these species continues as new individuals and small populations continue to be located. Several new, highly invasive species located on the HCA, that were unknown when CNLM began management include perennial pepper weed (*Lepidium latifolium*), perennial veldt grass (*Ehrharta calycina*), onion weed (*Asphodelus fistulosus*) and Ward's weed (*Carrichtera annua*). In some areas, such as the Greens, perennial tree species including eucalyptus (*Eucalyptus* ssp.) and palms (*Washingtonia robusta* and *Phoenix canariensis*) have not been removed because our budget does not permit complete removal at this time, which is necessary as we cannot leave dead biomass due to fire concerns. Non-native, annual species, such as tocalote (*Centaurea melitensis*), black mustard (*Brassica nigra*), Italian thistle (*Carduus pycnocephalus*), and non-native grasses (*Bromus* spp., *Brachypodium distachyon*) have also been controlled in areas occupied by threatened and sensitive plant species or in restoration sites.

Many sensitive plant and animal species surveys have been conducted which has resulted in new species being identified throughout the HCA. Research on sensitive plant species has been conducted and results have been analyzed. Based on these results species trends have been noted and insight has been gained into species biology and management. New weed treatments and management techniques in sensitive species occupied habitat have been utilized and researched. Researchers, San Diego County and City planners, and regulators regularly contact Preserve Managers to learn more about species biology and species and vegetation distribution and management. The trail system has been maintained by CNLM, the City of Carlsbad, City of San Marcos, and volunteers and illegal trails have been blocked using fences and natural materials. Significant progress has been made with the public regarding illegal trail construction and authorized trail uses. Additionally, the public is regularly encountered and educated during patrol efforts, public volunteer events, and through the use of kiosk information and signage. The majority of the visiting public respect the HCA and realize its biological importance. Many volunteer events

that protect and improve sensitive species habitat have occurred including Boy Scout and Eagle Scout projects. Itinerant encampments have also been located and removed from the Greens. Overall, the HCA is very healthy and also very unique to southern California. It is also surrounded by development that makes it susceptible to human impacts.

C. Purpose of this Management Plan

CNLM is a science-based, non-profit 501(c) 3 corporation established to protect natural resources through long-term stewardship of sensitive natural areas. CNLM manages over 4,000 acres in San Diego County, over 30,000 in the State of California, and 5,000 in the State of Washington. Several other CNLM preserves also support the same biological resources that are present in the HCA and current CNLM staff collectively have close to fifty years of management experience.

This revised HMP represents a comprehensive and cost-effective management approach essential to supporting an ecologically sustainable conservation area. The HMP will outline the HCA's resources and characteristics and will provide a brief overview of general tenets of conservation biology for natural areas management as it applies to this HCA. This HMP is consistent with the goals of the MHCP Monitoring and Management Plan (CDFG, USFWS, & CBI, 2003), the City of Carlsbad's HMP (City of Carlsbad, 2004), the City of Carlsbad's Open Space Management Plan (TAIC, 2004), the City of San Marcos' draft MHCP Subarea Plan (City of San Marcos, 2001) and the previously approved HMP for the La Costa Preserve (CNLM, 2005a). This HMP is intended to cover management activities from 2011 to 2015, at which time the HMP will be revised.

II. Habitat Conservation Area Description

A. Geographical Setting

The HCA is located approximately 2-5 miles inland from the Pacific Ocean and spans from El Camino Real to Elfin Forest (Figures 1 and 2). The HCA does not form one contiguous unit, and is separated by roads, highways, housing and commercial developments, golf courses and other natural areas. Adjacent natural open space exists to the south and east of the Huff parcel, which leads to Elfin Forest and north and north east of the Brouwer parcel (San Elijo Hills).

The topography varies dramatically between sub-sections (Figure 3). The La Costa Greens section is comprised of moderately sloping areas and flat terrain while the La Costa Oaks and Ridges section contains both moderate and very steep areas such as the Box Canyon riparian area, which contains vertical cliff faces in some areas. Elevation ranges from 300 to 1,100 feet above mean sea level.

B. HCA Boundaries and Adjacent Land Use

The western portions of the HCA (the Greens, Cassia, western portions of Box Canyon) are located in a portion of San Diego County that has been highly fragmented by development, while the eastern portions of the HCA are surrounded by contiguous open space (Elfin Forest Off-Site parcel and Choumass-Pappas). Residential homes, businesses, golf courses, a closed landfill, avocado orchards, and many roads comprise the HCA boundaries (Figure 2). The HCA boundaries differ by parcel and location. In some areas, the boundaries are demarcated with pvc pipe or wooden lath stakes (Elfin Forest Off-site parcel and portions of the Greens parcel) or fences (southern boundary of the Alemere parcel) but in other areas, the boundary is not marked and one would need to use the SanGIS parcel boundary database and a Geographic Information System (GIS) program to locate the boundaries.

Six Homeowner Association (HOA) manage property (such as common areas and fuel zones) adjacent to the HCA (and in some cases manage areas within the HCA) and are listed below. CNLM staff routinely work with these HOA's and their property managers to inform them about the HCA or address problems or issues.

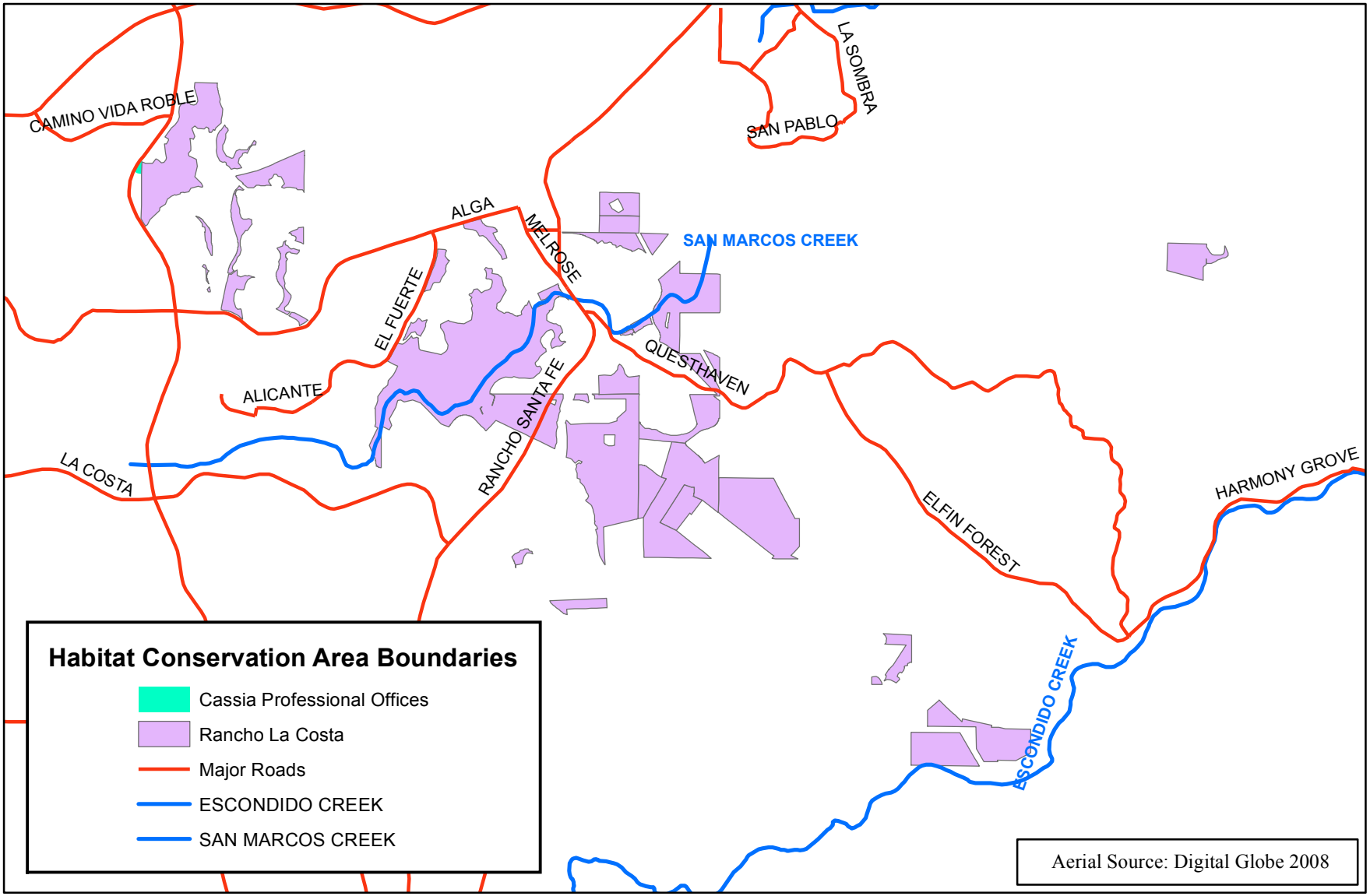

Figure 1: Preserve Location

Rancho La Costa Habitat Conservation Area, CA

910 455 0 910 Meters

Center for Natural Lands Management

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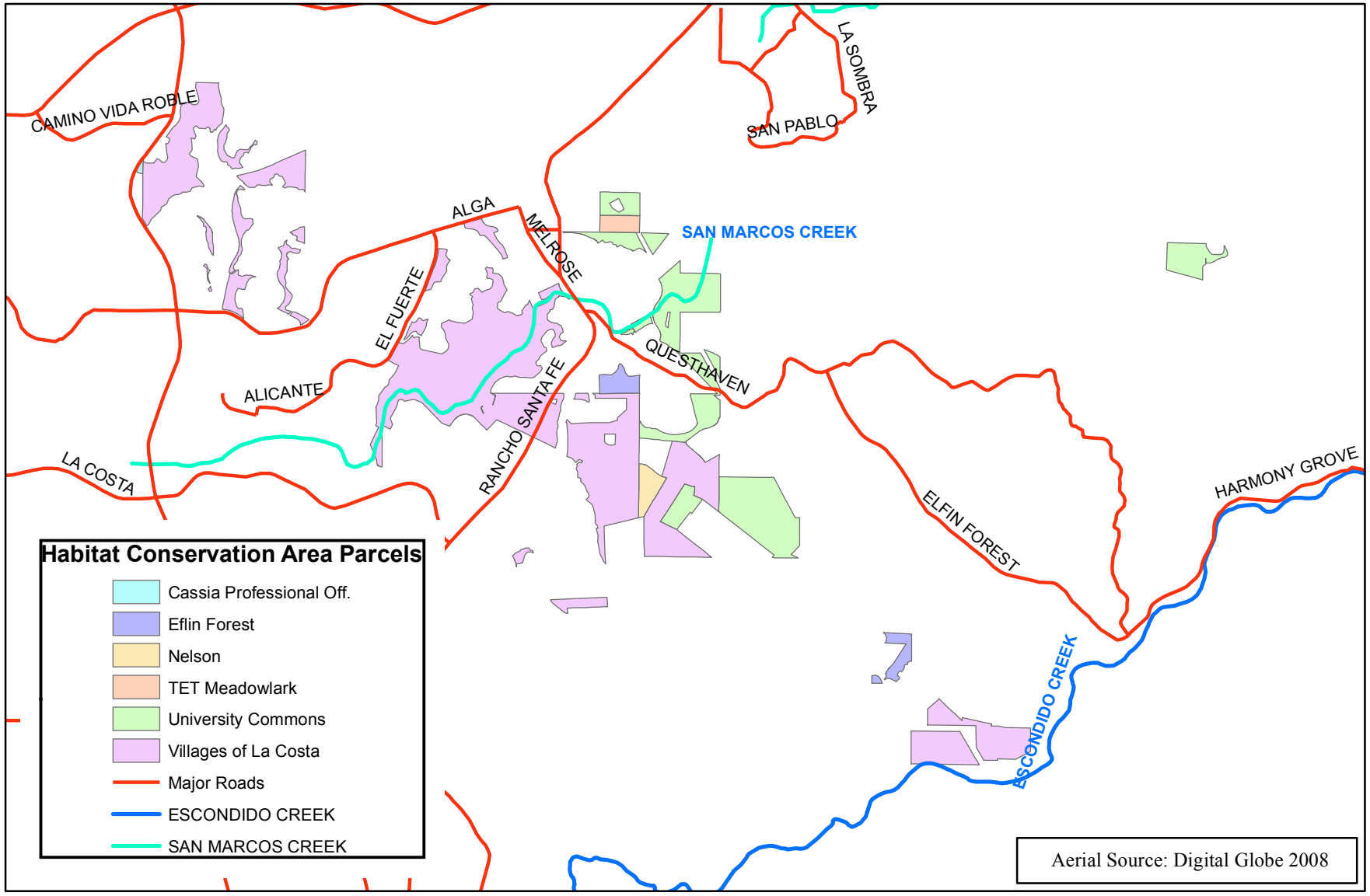

Figure 2: Preserve Vicinity

Rancho La Costa Habitat Conservation Area, CA

910 455 0 910 Meters

Center for Natural Lands Management

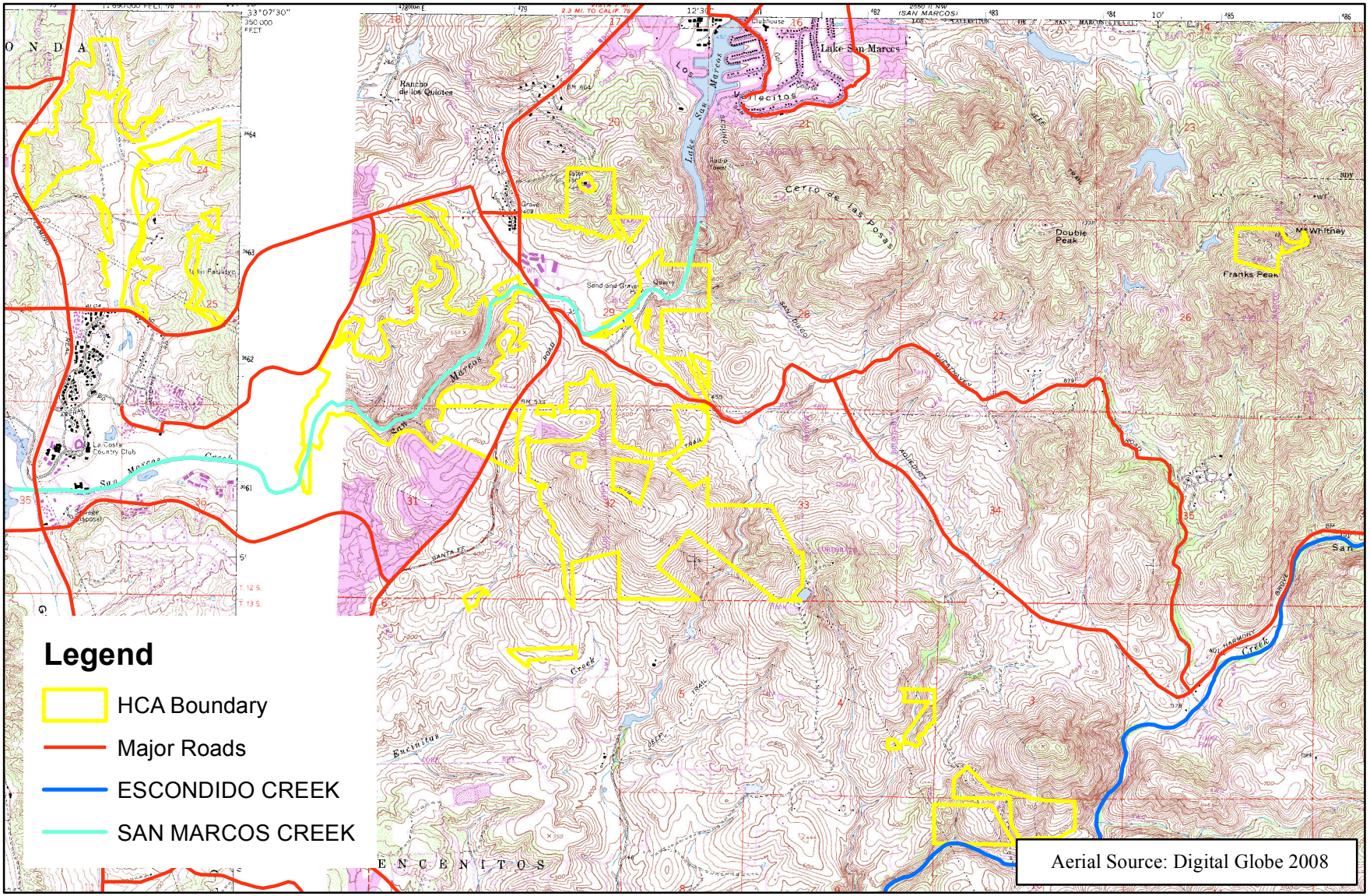

Figure 3: Habitat Conservation Area Topography

Rancho La Costa Habitat Conservation Area, CA

770 385 0 770 Meters

Center for Natural Lands Management

Adjacent home developments and respective property managers:

The Greens, The Oaks, The Ridges, Old Creek Ranch, Brouwer Quarry (fuel zone on CNLM property), University Commons On-site PA12 (fuel zone on CNLM property) [Also San Elijo Hills)
Walters Management (Property Management Company for these HOA's)
1959 Palomar Oaks Way, Suite 320
Carlsbad, CA 92011-1313
Phone: 760-431-2522

Seapoint Condominiums (next to Box Canyon)
Lindsay Management Services (Property Management Company for HOA's)
6126 Innovation Way
Carlsbad, CA 92009
Phone: 760-436-1144

Larkspur Creek Condominiums and Larkspur Heights/Calico Bluffs Condominiums (next to University Commons On-site (maintain slopes/fuel zones on and adjacent to CNLM property in PA 2 and PA6)
The Prescott Companies (Property Management Company for HOA). (Becky Colgan)
16880 West Bernardo Drive
San Diego, CA 92127
Phone: 858-946-0320

53 Melrose Place Homes (near Melrose and Rancho Santa Fe Road intersection)
Action Property Management
835 5th Avenue, Suite 407
San Diego, CA 92101
Phone: 800-400-2284

Solaire Condominiums (south of San Elijo Road)
Professional Community Management of California, Inc.
5927 Priestly Drive, Suite 110
Carlsbad, CA 92008
Phone: 760-918-8040

Camden Apartments and Condominiums (adjacent to Elfin Forest On-site) Camden Property Trust-Charlie Morgan 1935 Northstar Way San Marcos, CA 92078 Phone: 760-510-1005	Cornerstone Communities (next to PA 1 slope) Contact Jack Robson (represents HOA at this time) 858-458-9700 x 120

C. Geology and Soils

Eleven soil series compose the HCA (USDA, 1973). These soils range from very stable to highly erosive with slopes between 2 and 75 percent. The drastic range in soil stability and percent slope can be attributed to the large geographic span of the HCA. The Greens, which is coastal, is primarily composed of clay soils and soils associated with old coastal ridges. The eastern areas, in the vicinity of Franks Peak, Elfin Forest, Huff, and Denk Mountain are all composed of loamy soils derived from metabasic and metavolcanic rock (USDA, 1973). Based on these soil data, the soil series found in the eastern areas of the HCA are very common and tend to comprise the majority of the soils located on other private properties adjacent to these eastern portions of the HCA. The clay soil series and those series with clay substrates are uncommon and based on those soil data; many of these clay soil areas, adjacent to the Greens, now support industrial and housing developments. The Greens and portions of Rancho Carrillo appear to be some of the only remaining clay-based soil areas east of El Camino Real, between Palomar Airport Road and Alga Avenue. Many of these clay-based soils are known to support sensitive plant species such as thread-leaf brodiaea

Table 2: HCA Soil Series Descriptions

Soil Series	Soil Series Abbreviation	Location in the HCA	General Series Description*
Altamont Clay	AtC, AtD2, AtE, AtE2, AtF	The Greens.	Well drained clays that formed in the material weathered from calcareous shale. Stable and eroded soils with slopes between 5-50 percent.
Cieneba	CmE2, CmrG	Elfin Forest On-site and University Commons On-site (along San Elijo Road and a portion of the Brouwer Quarry area).	Excessively drained very shallow to shallow coarse sandy loams. Soils formed in material weathered in place from granitic rock. Slopes are between 9-75 percent.
Exchequer	ExE, ExG	Most common soil series found on Franks Peak/Pfau, Choumass-Pappas, Elfin Forest off and on-site, Denk Mountain, Huff, and University Commons on-site.	Shallow and very shallow well drained silt loams that formed in material weathered from hard metabasic rock. Slopes are between 9-70 percent.
Gaviota	GaE	The Greens.	Well drained shallow, fine sandy loams that formed in material weathered from marine sandstone. Slopes are between 9-30 percent.
Huerhuero	HrC, HrE2, HrC2	Small inclusions found on the Greens and on the Winston parcel and Lots 8 and 11.	Moderately well drained loams that have a clay subsoil. Soils developed in sandy marine sediments. Slopes are between 2-30 percent.
Las Flores	LeC	The Greens.	Moderately well drained loamy fine sands that have a sandy clay subsoil. Material weathered from siliceous marine sandstone. Slopes are between 2-9 percent.
Loamy Alluvial Land	LvF3 (Huerhuero Complex)	The Greens.	Found on old coastal ridges. Severely eroded soils and alluvial fill found along drainage ways. Slopes are between 9-50 percent.
Olivenhain	OhE	Lower portion of Box Canyon.	Well drained, moderately deep to deep cobbly loams that have a cobbly clay subsoil. Formed in old gravelly and cobbly alluvium on dissected marine terraces. Slopes are between 9-30 percent.
Salinas	ScA	The Greens.	Well drained and moderately well drained clay loams that formed in sediments washed from Diablo, Linne, Las Flores, Huerhuero, and Olivenhain soils. Slopes are between 0-2 percent.
San Miguel	SmE, SnG	Common soil series found on Choumass-Pappas, Elfin Forest off-site, Denk Mountain, University Commons on-site, Huff, and East Ridgeline Trail area.	Well drained shallow to moderately deep silt loams that have a clay subsoil. Soils derived from metavolcanic rock. Slopes are between 9-30 percent.
Visalia	VaB	The Greens.	Moderately well drained, very deep sandy loams derived from granitic alluvium. Found on alluvial fans and floodplains. Slopes are between 2-5 percent.

* Soil series descriptions taken directly from the Soil Survey of San Diego Area, California (USDA, 1973).

(*Brodiaea filifolia*) (TLB) and San Diego thornmint (*Acanthomintha ilicifolia*) (SDTM). Brief soil descriptions and locations are included in Table 2.

D. Historical Land Use

The Greens portion of the HCA was included in the historic 13,000-acre Rancho Agua Hedionda Spanish Land Grant. Spanish grant lands were primarily used for cattle and sheep grazing, due to the large extent of pasture or forblands that were present within the geographic boundaries of each grant area. Historical aerials of the Greens parcels dating from 1939, 1963, and 1991 were reviewed to determine the historical land uses in the area as it was assumed that the largest amount of historical change would be observed on the Greens parcel (Figures 4-6). From the 1939 aerial, it is clear that "grassland or forbland" areas and some coastal sage scrub and chaparral within the Greens parcels had been cleared and used for dryland farming or possibly grazing. The chaparral and coastal sage scrub stands comprise roughly the same spatial extent in the HCA presently as in the 1939 aerial. El Camino Real is a dirt road and portions of the present-day Alicante and Alga Avenues are also evident. The riparian areas were much reduced in 1939, perhaps as a result of the dry land farming. By 1963 it is clear to see that dryland farming was replaced in many areas with row crop farming; however it does appear that dryland farming, clearing of native vegetation, and/or grazing was still in practice. At least one earthen dam was installed across the northern riparian area by 1963 and many new dirt roads that traverse the HCA are evident. The riparian areas are still reduced in spatial extent in the 1963 aerial and it appears that some of the coastal sage scrub, evident in the 1939 aerial, had been cleared as evidenced by the 1963 aerial. By 1991, large tracts of developed land are visible to the south, east and west of the present-day Greens parcel. The lands bordering the northern boundary were still being used for agricultural purposes in 1991, but it does appear that the row crop farming had ceased on the Greens. The golf course, that splits the Greens parcels, is evident in the 1991 aerial and Alga Avenue had been constructed and paved.

Portions of the HCA, near Melrose Avenue were historically used as a gravel and rock quarry (Brouwer Quarry), but most of this area has been cleaned up and restored as part of the compensatory mitigation requirements associated with various project developments. Old copper mines can still be located on Denk Mountain and portions of this mountain were historically included in the Rancho Encinitas Spanish Land Grant. Mineral rights are still owned by private individuals in the vicinity of Denk Mountain; although no mining has occurred in the area since the mid-1900's. Portions of the Huff parcel were historically used as a mulching facility, but this area has also been restored to native habitat. Many old dirt roads that traverse the HCA can still be seen (and driven in some cases). Evidence of historic water pumps and associated infrastructure can be found on the Elfin Forest off-site parcels and near to the Huff parcel (but on private land). Box Canyon, and Three Falls, the historic cliff jumping location is still present and has been used since the 1960's, if not earlier. Several old vehicles are in the bottom of the pools in the vicinity of the cliff jumping location. Much of the HCA was also likely occupied by Native Americans and evidence of this can be found at the Greens parcel in the form of shell middens and hand tools.

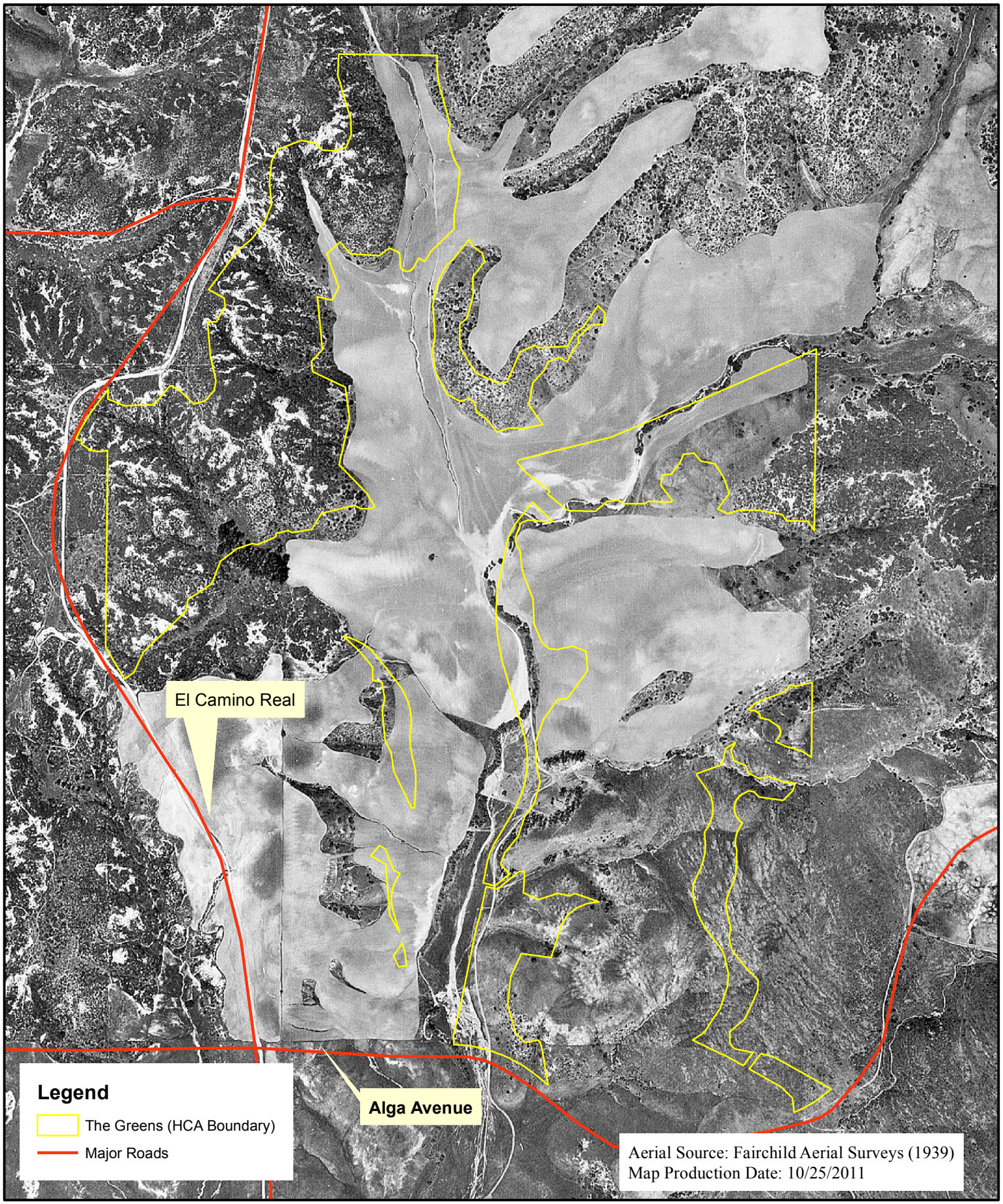

Figure 4: 1939 Historical Aerial
Rancho La Costa Habitat Conservation Area, CA

Meters
0 55 110 220 330 440

Center for Natural Lands Management

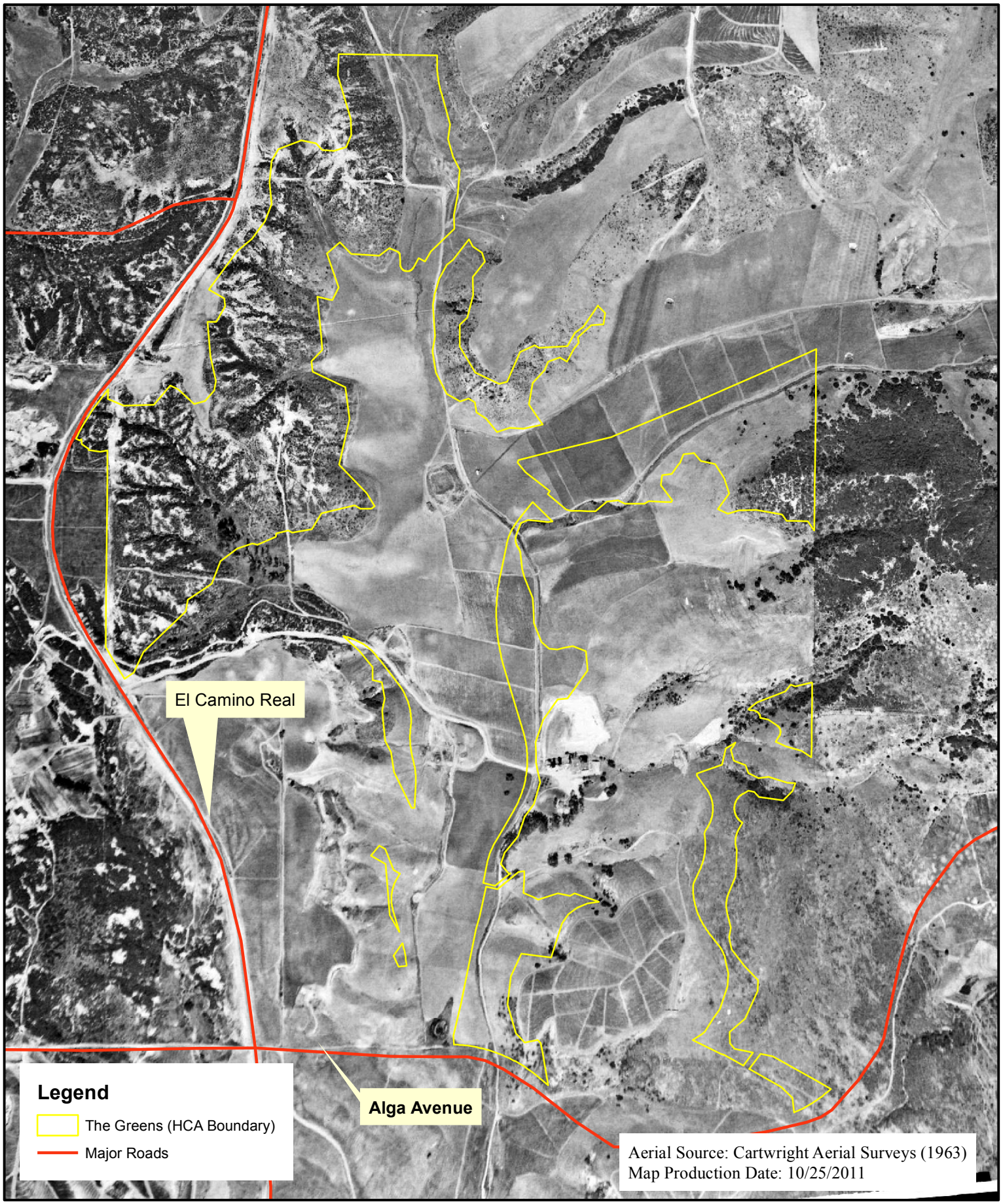

Figure 5: 1963 Historical Aerial
Rancho La Costa Habitat Conservation Area, CA

Meters
0 55 110 220 330 440

Center for Natural Lands Management

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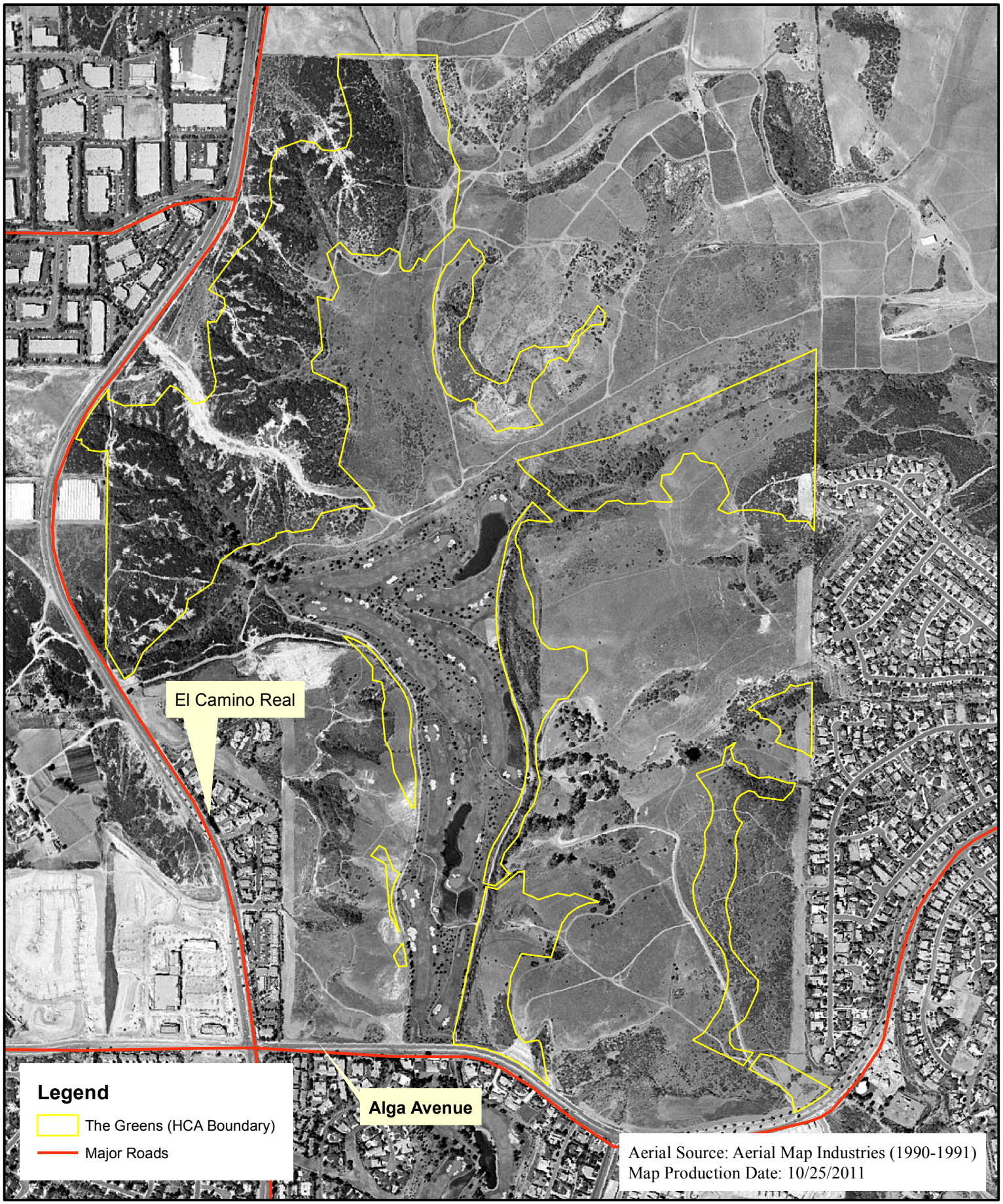

Figure 6: 1991 Historical Aerial
Rancho La Costa Habitat Conservation Area, CA

Meters
0 55 110 220 330 440

Center for Natural Lands Management

E. HCA Ownership and Legal Description

CNLM contact information is listed below. CNLM owns the majority of the HCA parcels; however, CNLM also holds CEs over several parcels. The CE parcels include: Lot 8, Elfin Forest on and off-site, and the Pfau. All of these CE's are part of the University Commons project. The APN and contact information for each CE parcel are listed below.

CNLM Contact Information

Center for Natural Lands Management: Headquarters
215 West Ash Street, Fallbrook, CA 92028
Ph: 760.731.7790. Fax: 760.731.7791
www.cnlm.org

San Diego Field Offices and Staff:

Markus Spiegelberg
San Diego Regional Preserve Manager
215 West Ash Street
Fallbrook, CA 92028
Ph/fax: 619.295.4953.
Email: mspiegelberg@cnlm.org

Jessica Vinje
San Diego Preserve Manager
215 West Ash Street
Fallbrook, CA 92028
Ph/fax: 760.294.8439
JVinje@cnlm.org

Conservation Easement Parcel Contact Information

Lot 8 – APN: 222-651-1100
Hunter Industries
1940 Diamond Street
San Marcos, CA 92069
760-744-5240

Elfin Forest On-Site – APN: 222-030-14 and -80
Camden USA, Inc.
c/o EProperty Tax
P.O. Box 4900 Dept. 112
Scottsdale, AZ 85261

Elfin Forest Off-Site – Geis Parcel: APN 264-031-2500
Devon Geis
1835 Seaquest Trail
Olivenhain, CA 92024

Elfin Forest Off-Site – Cheatham Parcel: APN 264-032-2700
Scott Cheatham
P.O. Box 7224
Rancho Santa Fe, CA 92067

Elfin Forest Off-Site – Ciarmoli Parcel: APN 264-032-2600
Leonard Ciarmoli
4224 Canyon de Oro
Escondido, CA 92029

Elfin Forest Off-Site – Witt Parcel: APN 264-032-2500
Jeff and Sarah Witt
4097 Canyon de Oro
Escondido, CA 92029

Pfau Easement
APN 222-130-1300
Pfau, Pfau and Pfau LLC.
533 Waters Edge
Newton Square, PA 19073

F. Utility and Other Easements

The primary easements are in favor of San Diego Gas and Electric (SDG&E), Vallecitos Municipal Water District, Olivenhain Municipal Water District, Leucadia Waste Water District, and the San Diego County Water Authority. The easements to these public utilities are located throughout Carlsbad, San Marcos, and the unincorporated county areas. CNLM staff regularly work with the easement holders on easement access issues and easement grading and vegetation clearing. Contact information for these easement holders is provided below.

SDG&E
Jeff Sykes - Land Management Supervisor
8335 Century Park Court
San Diego, CA 92123
Phone: 858-654-1235

Olivenhain Municipal Water District
Tom Kennedy – Operations Manager
George Briest – Engineering Manager
1966 Olivenhain Road
Encinitas, CA 92024
Phone: 760-753-6466

San Diego County Water Authority
Tad Brierton - Supervisor of Right of Way Property Management
4677 Overland Avenue
San Diego CA 92123
Phone: 858-522-6915

Vallecitos Municipal Water District
Rich Arrant – Operations Manager
Ken Gerdes – Engineering Manager
201 Vallecitos De Oro
San Marcos, CA 92069
Phone: 760-744-0460

Leucadia Waste Water District
Frank Reynaga – General Manager
1960 La Costa Avenue, Carlsbad, CA 92009
Phone: 760-753-0155

G. Other Contact Information

Center staff work regularly with the Cities of Carlsbad and San Marcos, and the CDFG and USFWS staff to resolve issues and provide information (i.e. annual reports, work plans and management plans). We also continue to have contact with Morrow Development and Brookfield Homes, the original project developers. Contact information for all involved parties is listed below.

City of Carlsbad
Parks and Recreation Department
Liz Ketabian, Trails Planner
1635 Faraday Avenue
Carlsbad, CA 92008
Phone: 760-434-5088

City of San Marcos
Craig Sargent-Beach
Community Services, Parks and Recreation
1 Civic Center Drive
San Marcos, CA 92069
Phone: 760-744-1050

California Department of Fish and Game
David Mayer
4949 Viewridge Avenue
San Diego, CA 92123
Phone: 858-467-4234

U.S. Fish and Wildlife Service
Janet Stuckrath
6010 Hidden Valley Road
Carlsbad, CA 92011
Phone: 760-431-9440

Morrow Development
Fred Arbuckle
2131 Palomar Airport Rd., # 200
Carlsbad, CA 92011-1435
Phone: 760-929-2701

Brookfield Homes
David Poole
12865 Pointe Del Mar, Suite 200
Del Mar, CA 92014
Phone: 858-481-8500

III. Habitat and Species Description

A. Vegetation Communities

The HCA consists primarily of two vegetation communities, Diegan coastal sage scrub (DCSS) and southern mixed chaparral (Table 3 and Figure 7). However, in the Greens parcels, the dominant vegetation community is southern maritime chaparral (SMC). The DCSS and SMC communities have experienced significant reductions in spatial extent over the past 100 years in San Diego County. It has been estimated that approximately 70 percent and 87 percent of DCSS and SMC, respectively have been permanently lost (Ogden, 1998 & USFWS, 2010). Other vegetation communities that occur include southern mixed chaparral, native grassland, non-native grassland, sycamore/oak woodlands, coast live oak woodland, southern willow scrub, and disturbed phases of the aforementioned vegetation communities.

The vegetation community acreages listed in Table 3 are mostly outdated. The Greens vegetation communities were re-mapped and acreages updated in 2010. Vegetation communities at the Greens were mapped using the Draft Vegetation Communities of San Diego County (Oberbauer, Kelly & Buegge, 2008). The rest of the HCA vegetation communities were mapped at various times using various methods, throughout the history of each associated development project. That means in some cases, vegetation community mapping and subsequent acreages have not been updated for a decade or more. Over the next five-year period, vegetation mapping of the entire HCA will be conducted and acreages adjusted as necessary. There will likely be changes in HCA vegetation community type acreage. For example, the current estimation of 84 acres of disturbed habitat will be reduced because many of these areas have since been restored or are in the process of being restored.

B. Animal Species

Focused sensitive bird surveys, wildlife corridor monitoring, and ant monitoring occurred during the 2005-2010 management plan period. Several animal survey activities were also conducted from 2001-2005, including avian point count stations, reptile pit arrays, and ant studies. Results from these surveys are summarized in the HMP (CNLM, 2005a) and annual reports submitted during that time period (CNLM, 2002-2004; CNLM, 2005b; CNLM, 2006-2010a).

The HCA supports a diverse assemblage of animal species. A total of 133 native and non-native animal species have been observed in the last 10 years (Appendix A). Notable species long-tailed weasel (*Mustela frenata*), mule deer (*Odocoileus hemionus*) and bobcat (*Felis rufus*).

C. Plant Species

Native and non-native plant species observations are continually added to the plant list each year as new species are encountered. The plant species list is going to continue increasing for the foreseeable future, as new plants are found annually. Three hundred and eighty-five (385) plant species have been identified of which 102 (26%) are non-native to the area (Appendix B).

D. Sensitive Species

Many sensitive plant and animal species have been observed (Tables 4 and 5 and Figures 8 and 9). There are six federally or state-listed threatened or endangered species: CAGN, least Bell's vireo (*Vireo bellii pusillus*) (LBV), Del Mar manzanita (*Arctostapyhlos glandulosa* ssp. *crassifolia*) (DMM), SDTM, TLB, and Orcutt's hazardia (*Hazardia orcuttii*) (OH). There are also a number of MHCP "covered" species, such as the San Diego horned lizard (*Phrynosoma coronatum blainvillei*), orange-throated whiptail *(Aspidoscelis hyperthrus beldingii),* southern California rufous-crowned sparrow (*Aimphila ruficeps cansescens*), spade-foot toad (*Scaphiopus hammondii*), San

Table 3: Vegetation Communities (2010)

Vegetation Communities	Area (acres)
Southern Maritime Chaparral	74.06
Disturbed Southern Maritime Chaparral	0.61
Southern Mixed Chaparral	251.55
Coastal Sage-Chaparral Transition	1.39
Diegan Coastal Sage Scrub	892.78
Disturbed Diegan Coastal Sage Scrub	5.12
Baccharis Scrub-Coyote Bush dominated	6.87
Native Grassland Coastal Sage Scrub	0.70
Valley Needlegrass Grassland	9.66
Non Native Grassland	49.15
Non Native Grassland-broadleaf Dominated	0.10
Southern Willow Scrub	39.67
Disturbed Southern Willow Scrub	4.97
Baccharis Scrub-Mulefat dominated	2.76
Riparian Woodland	3.60
Sycamore/Live Oak Woodland	7.38
Coast Live Oak Woodland	1.12
Freshwater Marsh	8.41
Alkali Seep	0.17
Coastal Brackish Marsh	2.57
Open Water	0.31
Disturbed Wetland	0.51
Non Native Woodland	2.30
Cliff	3.55
Disturbed Habitat	84.42
Developed	3.78
Total	**1457.51**

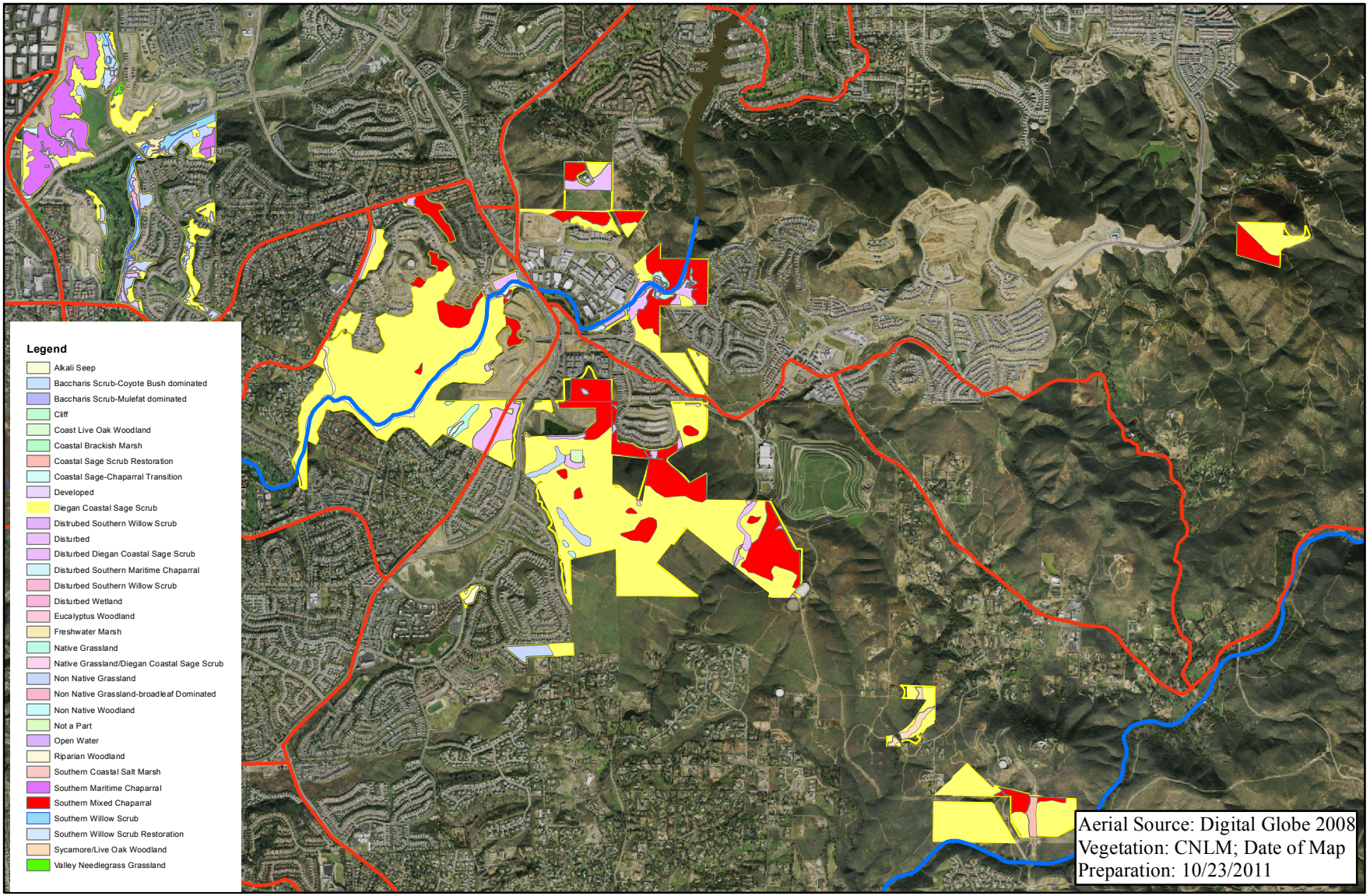

Figure 7: Vegetation Communities

Rancho La Costa Habitat Conservation Area, CA

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Table 4: Sensitive Plants

Sensitive Plant and Status*	2005	2006	2007	2008	2009	2010
San Diego Thornmint (*Acanthomintha ilicifolia*) FT/SE, MHCP-covered species; CNPS List 1B.1	NS	150	26	194	251	380
Del Mar Manzanita (*Arctostaphylos glandulosa* var. *crassifolia*) FE, MHCP-covered species; CNPS List 1B.1	NS	NS	NS	9[1]	NS	NS
California Adolphia (*Adolphia californica*) CNPS List 2.1	Many patches	Many patches	Many patches	Many patches	Many patches	Many patches
San Diego Sagewort (*Artemisia palmeri*) CNPS List 4.2	NA	NA	NA	NA	NA	>150 individuals
San Diego County Sunflower (*Bahiopsis laciniata*) CNPS List 4.2	NA	NA	NA	NA	NS	~100 individuals
San Diego Goldenstar (*Bloomeria clevelandii*) CNPS List 1B.1	NS	NS	NS	NS	1,321	NS
Thread-leaf Brodiaea (*Brodiaea filifolia*) FT/SE, MHCP-covered species; CNPS List 1B.1	2,500-3000	83	0	8,291	8,305[2]	NS
Orcutt's Brodiaea (*Brodiaea orcuttii*) CNPS List 1B.1	NS	NS	NS	1,265	NS	1,319[5]

Sensitive Plant and Status*	2005	2006	2007	2008	2009	2010
Wart-stemmed Ceanothus (*Ceanothus verrucosus*) MHCP-covered species	NS	NS	NS	1,384,056[7]	NS	NS
Summer Holly (*Comarostaphylis diversifolia* ssp. *diversifolia*) MHCP-covered species; CNPS List 2.2	NS	NS	NS	254	NS	NS
Western Dichondra (*Dichondra occidentalis*) CNPS List 4.2	Many patches	Many patches	Many patches	Many patches	Many patches	Many patches
Sticky-leaved Live Forever (*Dudleya viscida*) CNPS List 1B.1	NS	NS	NS	6,280	NS	NS
Chocolate lily (*Fritillaria biflora* var. *biflora*) notable locality	NA	NA	NA	NA	NA	12 individuals
Palmer's Grappling Hook (*Harpagonella palmeri*) CNPS List 4.2	NS	NS	NS	NS	NS	NS
Orcutt's Hazardia (*Hazardia orcuttii*) FC/ST; MHCP-covered species; CNPS List 1B.1		160	NS	NS	156 adults	156 adults 10 seedlings
San Diego Marsh Elder (*Iva hayesiana*) MHCP-covered species; CNPS List 2.2	NS	NS	NS	Many large patches[4]	NS	Several more patches located in 2010[4]

Sensitive Plant and Status*	2005	2006	2007	2008	2009	2010
Southwestern Spiny Rush (*Juncus acutus* ssp. *leopoldii*) CNPS List 4.2	NS	NS	NS	542[3]	NS	552[3]
Robison's Peppergrass (*Lepidium virginicum* var. *robinsonii*) CNPS List 1B.2	NA	NA	NA	NA	NS	NS
Golden-ray Pentachaeta (*Pentachaeta aurea*) CNPS List 4.2	NA	NA	NA	NA	One large patch	Same large patch relocated.
Nuttall's Scrub Oak (*Quercus dumosa*) MHCP-covered species; CNPS List 1B.1	NS	NS	NS	8,906	NS	8,924[6]
Engelmann Oak (*Quercus engelmannii)* MHCP-covered species; CNPS List 4.2	NA	NA	NA	NA	NA	3
Ashy spike-moss (*Selaginella cinerascens*) CNPS List 4.1	many patches	many patches	many patches	many patches	many patches	many patches

*FT = Federally threatened; FC = Federal species of concern; SE = State endangered; SE = State threatened; MHCP =Multiple Habitat Conservation Program; CNPS = California Native Plant Society sensitive species. CNPS list status not described in this HMP. NA = Not applicable because the occurrence was unknown at that time, NS = Not surveyed.

1. Likely more since not all individuals visited.

2. Results from 2008 added to results from new occurrence found in 2009. Number represents flowering individuals only. Actual population is likely closer to 50,000 TLB based on vegetative surveys. See section E.2.1 for vegetative survey results from TLB research study.

3. Surveys only conducted in eastern half of Box Canyon. Entire HCA not surveyed. Approximately 10 more individuals located in 2010. These 10 individuals were added to the original 542 individuals to equal 552 individuals.

4. Surveys only conducted in eastern half of Box Canyon. Entire HCA not surveyed.

5. Entire occupied habitat not surveyed. Results from 2008 added to results from new 2010 transplant occurrence. Number represents flowering individuals.

6. Entire occupied habitat not surveyed. Results from 2008 added to results from 2010.

7. This number represents an estimation. Refer to section IV. F. for an explanation of the methods used to obtain the estimation.

Table 5: Sensitive Wildlife Species

Species and Status*	Year					
	2005	2006	2007	2008	2009	2010
Birds						
Cooper's hawk (*Accipiter cooperi*) CSC; MHCP covered species	Occasional	Occasional	Occasional	Occasional	Occasional	Occasional
Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*) FSC/CSC; MHCP covered species		Observed, common	Observed, common	Observed, common	Observed, common	Observed, common
Bell's sage sparrow (*Amphisiza belli belli*) FSC/CSC; MHCP covered species	Observed, uncommon		Observed, uncommon			
Grasshopper sparrow (*Ammodramus savannarum*) SC2	Observed, uncommon					
Northern harrier (*Circus cyaneus*) SC2			Observed, uncommon			
Yellow Warbler (*Dendroica petechia)* SC3	Observed, uncommon					
White Tailed Kite (*Elanus cyaneus*)	Occasional	Occasional	Occasional	Occasional	Occasional	Occasional
California Horned Lark (*Eremophila alpestris)*	Observed, uncommon					
Yellow-breasted chat (*Icteria virens*) CSC; MHCP covered species	Observed, uncommon					Observed, uncommon
Loggerhead Shrike *(Lanius ludovicianus)* SC2	Observed, uncommon		Observed, uncommon			
Coastal California gnatcatcher (*Polioptila californica californica*) FT/CSC, MHCP covered	Observed, common	Observed, common	44 pair; 10 single males; 5 unidentified individuals	Observed, common	Observed, common	28 pair; 11 single males; 1 family group
Western bluebird (*Sialia mexicana*) none; MHCP covered species	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon
Least Bell's vireo (*Vireo bellii pusillus*) FE/CE; MHCP covered species	Observed, uncommon				Observed, uncommon	Observed, uncommon

Species and Status*	Year					
	2005	2006	2007	2008	2009	2010
Mammals						
Mule deer (*Odocoileus hemionus fuliginata*) CA Game species; MHCP covered species	Common	Common	Common	Common	Common	Common
Black-tailed jackrabbit (*Lepus californicus bennetti*) FSC/CSC; MHCP covered species	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon
Reptiles						
Orange-throated whiptail (*Aspidoscelis hyperythrus beldingi*) FSC/CSC; MHCP Covered Species	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon
Red Diamond Rattlesnake (*Crotalus ruber*) CSC			Observed, uncommon	Observed, uncommon	Observed, uncommon	Observed, uncommon
San Diego horned lizard (*Phrynosoma coronatum blainvillei*) CSC		Observed, uncommon			Observed, uncommon	

*FSC = Federal species of concern; CSC = State Species of Special Concern; SC2 = Species of Special Concern, Priority 2; SC3 = Species of Special Concern, Priority 3; MHCP = Multiple Habitat Conservation Plan

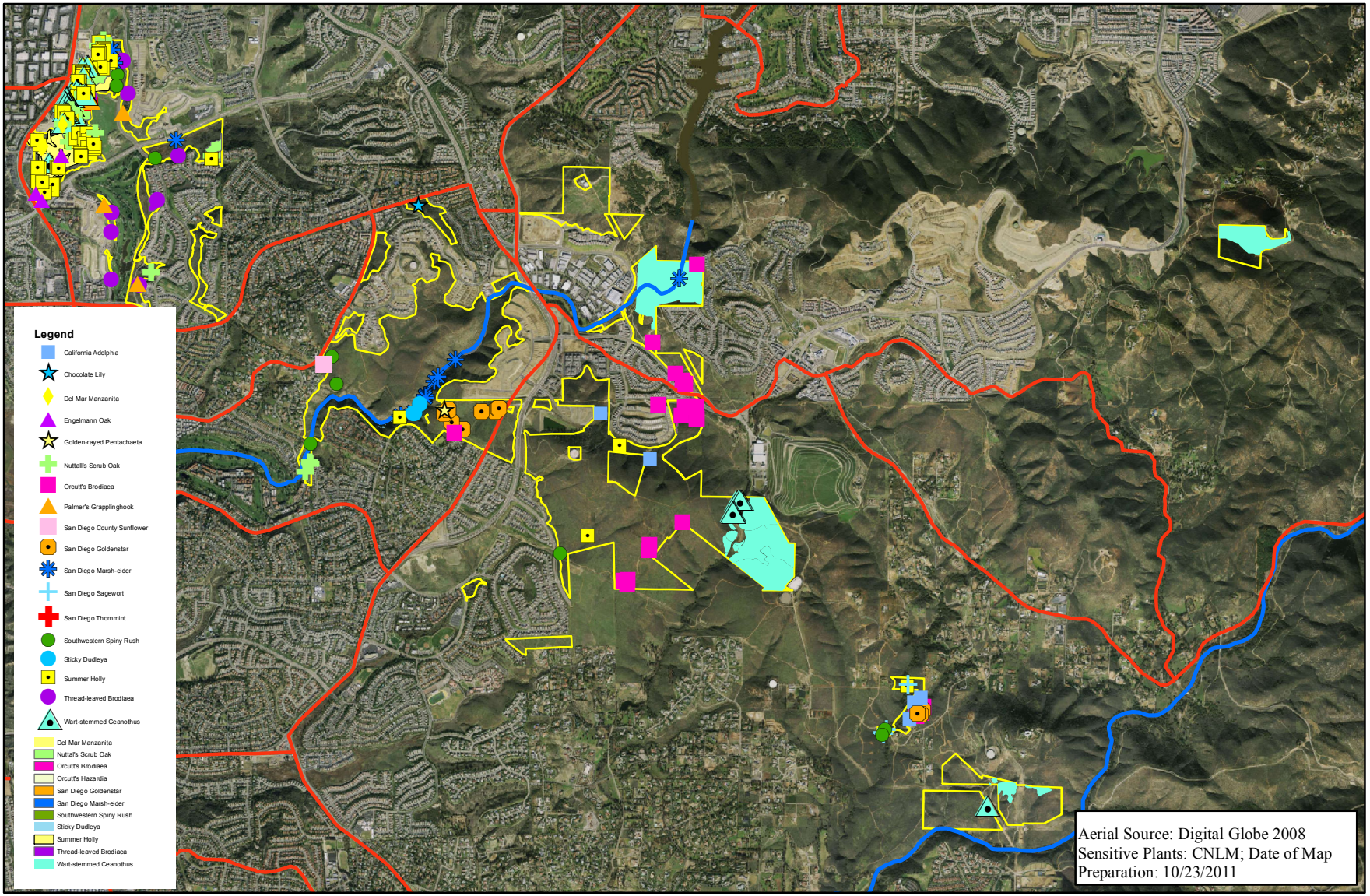

Figure 8: Sensitive Plants

Rancho La Costa Habitat Conservation Area, CA

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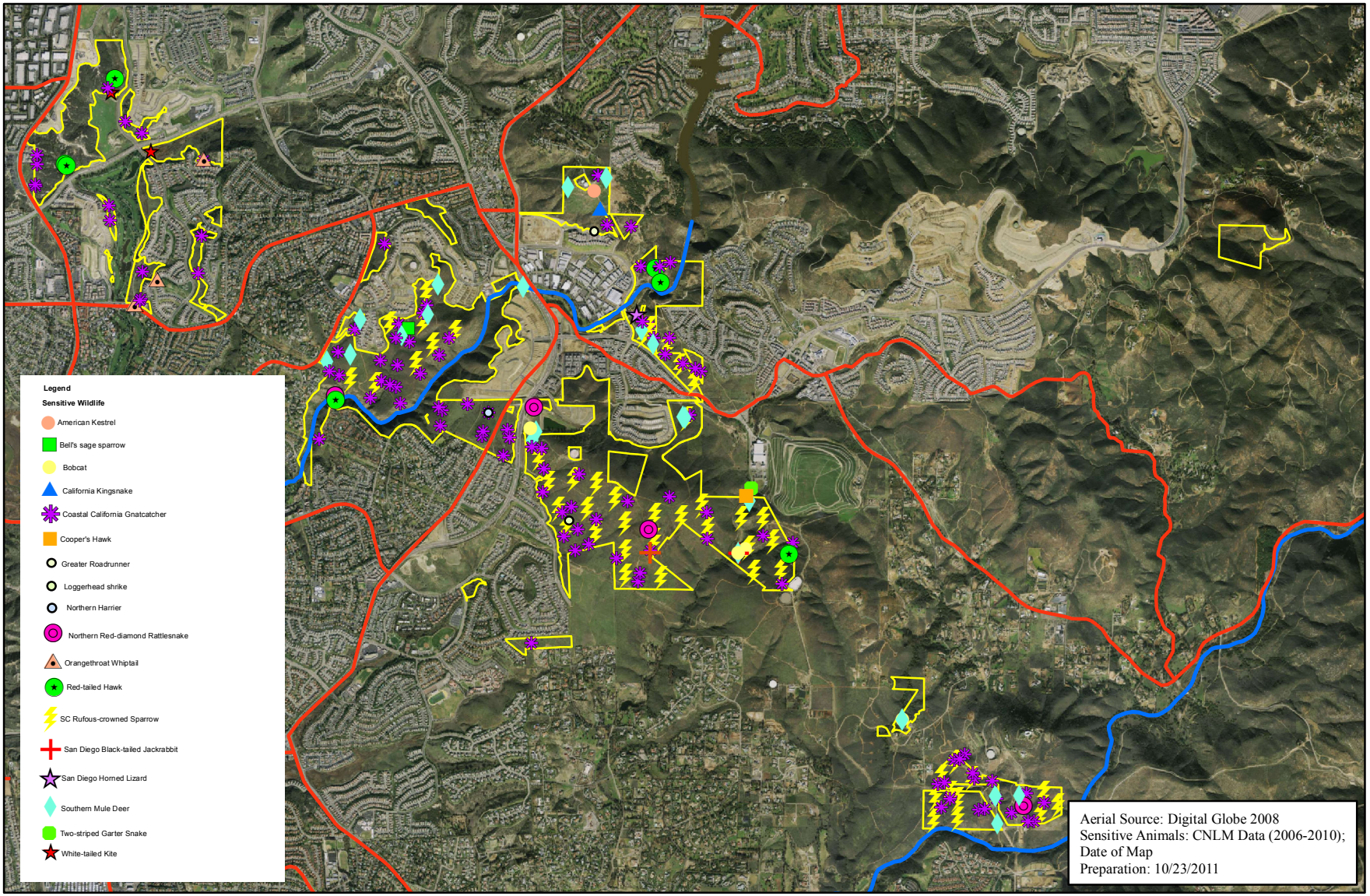

Figure 9: Sensitive Wildlife

Rancho La Costa Habitat Conservation Area, CA

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Diego marsh-elder (*Iva hayesiana*), Palmer's sagewort (*Artemisia palmeri*), and wart-stemmed ceanothus (*Ceanothus verrucosus*).

The following section describes the status of the six threatened and endangered species:

1. Coastal California Gnatcatchers: Complete preserve-wide CAGN surveys occurred in 2007 and 2010. Prior to those years, only portions of the HCA were surveyed, as CNLM had to wait until legal interest in a parcel or area was obtained (Table 6). The total number of territories recorded during the 2010 survey effort was 40. This is a reduction from the number of territories recorded during the 2007 surveys, which were 59. The largest differences occurred at the West Ridgeline Trail/Box Canyon area (9 territories in 2010 and 12 territories in 2007), East Ridgeline Trail/Old Rancho Santa Fe area (3 territories in 2010 and 7 territories in 2007), and Denk Mountain/Huff areas (5 territories in 2010 and 18 territories in 2007).

   CNLM is unsure why fewer CAGN were located in 2010, but one possible explanation is that the CAGN population within the HCA is continuing to stabilize after all the mass grading in the HCA vicinity over the past decade (grading associated with developments). Grading in the vicinity likely pushed CAGN from the impacted areas into the HCA, leading to a temporary increase in this species. Continued, long term surveys will yield more information on whether or not this fluctuation is within the range of normal for the species. Additionally, there was a high level of black sage (*Salvia mellifera*) mortality that was noticed in 2007 on Denk Mountain, portions of University Commons on-site, and the west Ridgeline Area. CNLM assumes that the high level of mortality was associated with drought. Most of these areas appear to be recovering now via seedling recruitment and basal sprouting, but some areas on Denk Mountain may not recover (i.e., southern aspect areas). Monitoring of these areas over time and continued CAGN surveys will determine if these areas will recover and provide suitable CAGN habitat.

2. Least Bell's Vireo: LBV have been observed in several locations over the past five years, including the Brouwer Quarry, Hidden Canyon (Huff parcel) and the Greens. It is likely that three territories for this species exist and pair status has been confirmed in the past for the LBV occurrence in the Brouwer Quarry.

3. San Diego thornmint: One SDTM occurrence was located in 2003, which was not previously identified in project biotechnical documents for La Costa Villages. It was estimated that 1,000 plants composed the occurrence. Approximately 194 plants were located in 2008, 251 plants in 2009, and 380 plants in 2010. The modest increase over the last few years suggests the population may be stable in spite of annual fluctuations expected in this type of species. The contrast with the larger population size recorded for 2003 is a result of the methodology—an estimate rather than direct count.

4. Del Mar manzanita: Originally, 1,000 plants were estimated to occur on the Greens (USFWS, 1995). However, based on a new morphological dichotomous key, DMM is now even more restricted than the original geographic extent (USFWS, 2010). Approximately 9 DMM were located during surveys at the Greens conducted in 2008. Over 80 *Arctostaphylos* plants were sampled and keyed during the surveys. It is likely that more DMM do exist on the Greens, as it was impossible to locate, hike to, and identify every single *Arctostaphylos* individual. One manzanita (*Arctostaphylos* ssp.) specimen from the Greens was collected in 2010 and sent to Dr. Jon E. Keeley, Research Ecologist at the United States Geological Survey. A journal article in Madrono – A West American Journal of Botany (Keeley, Vasey & Parker, 2007) discussed subspecific morphological variation in the *Arctostaphylos glandulosa* complex. Based on the findings reported in this article, it was determined that the majority of the manzanita shrubs at the Greens are the more common, Eastwood's Manzanita (*Arctostaphylos glandulosa* ssp. *glandulosa)*.

Table 6: Coastal California Gnatcatcher Status

Location	CAGN Status	2002	2003	2004	2005	2007*	2010*
The Greens	Pair			3	5	6	8
	Single Male			1	1	2	
Total Territories				4	6	8	8
West Ridgeline/Box Canyon	Pair	3	3	1	4	11	5
	Single Male		1			1	4
Total Territories		3	4	1	4	12	9
East Ridgeline/Old Rancho Santa Fe Road	Pair	1	2	1	1	7	3
	Single Male						
	Family Group			1			
Total Territories		1	2	2	1	7	3
Denk Mountain (incl. Winston Parcel)/Huff	Pair	4	2	6	2	17	5
	Single Male				1		
	Family Group				2		
	Juvenile				1		
	Sex and Status Unconfirmed					1	
Total Territories		4	2	6	6	18	5
University Commons On-site/Brouwer Quarry Areas	Pair	3	4	1	2	3	1
	Single Male			1		3	5
	Family Group						1
Total Territories		3	4	2	2	6	7
Choumass-Pappas	Pair		3	4		6	7
	Single Male			1	1	1	1
	Family Group				3		
	Sex and Status Unconfirmed					1	
Total Territories			3	5	4	8	8
HCA Total Territories		**11**	**15**	**20**	**23**	**59**	**40**

*Entire HCA surveyed in 2007 and 2010. Surveys in prior years only included those areas where CNLM had legal interest (fee or CE).

5. Thread-leaf Brodiaea: Originally 7,000 TLB plants were estimated to occur at the Greens based on the Biological Opinion for the Fieldstone/La Costa Development (USFWS, 1995). Direct flowering counts occurred for TLB in 2008. Approximately 8,291 flowering individuals were located during those surveys and another 14 plants were located in 2009, for a total flowering count of 8,305.

   Additionally, vegetative TLB surveys conducted in portions of the occupied habitat at the Greens have located over thirty thousand vegetative TLB individuals. It is likely that greater than 50,000 TLB actually occur at the Greens as vegetative surveys will yield a much higher population count than flowering surveys (CNLM, 2010b).

6. Orcutt's hazardia: In 2004, 200 OH plants were transplanted onto the Greens. These plants were grown from seed that was collected from the only known naturally- extant occurrence within the United States (at the Manchester Habitat Conservation Area in Encinitas, CA). Approximately 160 plants were located in 2006 and 156 plants were located in 2010. Approximately 8 OH seedlings and 2 juvenile individuals were also located in 2010 growing within the transplant occurrence. This is the first year that these seedlings and juveniles had been located in this transplanted occurrence. All of the seedlings established in early 2010 and the juveniles likely established in 2009 and are approximately 2 years old.

E. Non-native Plants and Animals

Non-native plants and animals occur as is common in all open space areas in southern California. The primary perennial invasive non-native plant species of concern are perennial pepper weed, perennial veldt grass, onion weed, pampas grass, fennel, myoporum, acacia, fountain grass, ice plant, eucalyptus, shamal ash (*Fraxinus uhdei*), and tree tobacco. All of these species are currently being treated in various locations. Treatment is either occurring using existing CNLM funding, grant funding, or compensatory mitigation funding. The species that are of most concern are perennial pepper weed and perennial veldt grass. These two species occur on the Greens and have been treated on an annual basis since 2007 (perennial pepper weed) and 2009 (perennial veldt grass). It is possible that these species can be eradicated over time, but it will take diligence and many years to accomplish this goal. The other invasive perennial species are of less concern as the majority of these species have been controlled to a level of less than one percent in area (acres). Several of the invasive tree species, such as the eucalyptus and palm trees will require funding that will allow for complete removal of these species due to the concern over fire (if dead biomass is left after treatment) as these species are primarily growing adjacent to residential developments and businesses.

The primary invasive annual non-native plant species of concern are Ward's weed, tocalote, black mustard, prickly sowthistle (*Sonchus asper*), Saharan mustard (*Brassica tourneforttii*), Italian thistle, and Crete hedypnois (*Hedypnois cretica*). These species are controlled, to the extent possible, in areas where they co-occur with listed plant species, such as SDTM. At this time, the primary species of concern is Ward's weed due to its high invasive ability and competitive nature. This species has been controlled since 2009 using existing CNLM funds and grant funding. The other annual species do not pose a major threat to the listed and sensitive plant species because their presence is being monitored, and controlled in some places. However, constant attention and control of these species is necessary to ensure long term survival of the listed and sensitive plant species.

The most concerning non-native invertebrate species, is the Africanized honey bee (*Apis mellifera scutellata*). Several colonies live in the bottom of Box Canyon and in the cliffs above Box Canyon. The public is prohibited from entering Box Canyon, so public contact with Africanized honey bees is low, although possible due to occasional public trespass into Box Canyon. Argentine ants (*Linepithema humile*) also occur to a greater or lesser extent depending on proximity to water and developed areas. Those areas closest to the HCA edge have the highest concentrations of Argentine ants (based on CNLM pit-fall trapping experiments). Another non-native invertebrate species that occurs throughout San Marcos Creek are crayfish (*Procambarus* spp.). The primary non-native vertebrate species are brown-headed cowbird (*Molothrus ater*), bull frogs (*Rana catesbiana*), red-eared slider turtles (*Trachemys scripta elegans*), blue gill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), the Virginia opossum (*Didelphis virginiana*), and the occasional stray house cat (*Felis domesticus*). Brown-headed cowbirds have been observed in low numbers at the Greens and in Box Canyon. The bullfrogs, sliders and fish have

been observed in San Marcos Creek and are likely numerous. Dead Virginia opossums have been observed on roads that traverse the HCA and stray house cats have been observed on occasion. The Virginia opossums and stray house cats are of little concern to Preserve Management at this time because their numbers are likely very low. The bullfrogs, non-native fish, and crayfish are of concern to Preserve Management; however, no sensitive or listed aquatic or riparian reptiles or amphibians (i.e. California newt, southwestern arroyo toad, and southwestern pond turtles) are known to occur in the portions of San Marcos Creek that CNLM currently manages. Additionally, control of these non-native species requires copious amounts of time and money. CNLM is unable to fund control of these species at this time, but may be able to in the future.

F. Fire History

The history of fire was researched by analyzing the CALFIRE, United States Department of Agriculture Forest Service Region 5, Bureau of Land Management and the National Park Service database (CALFIRE, 2005). Most of the HCA (not including the Greens) burned in the Harmony Grove fire in October of 1996. It is unknown when the Greens parcels last burned. Box Canyon also burned in 1935 (no month provided), and a partial burn in September of 1970. The area between Rancho Santa Fe Road and the Huff parcel also burned in 1945 (no month provided). It is also likely that there have been smaller, unrecorded fires over the last 100 years.

IV. Previous Biological Goals, Objectives, Methods, and Results

The following section lists the previous biological goals and objectives for vegetation communities, and sensitive wildlife and plant species and summarizes results for activities which were conducted between 2005-2010 (Table 7) the time span of the previous HMP (CNLM, 2005a).

A. Diegan Coastal Sage Scrub

Goal. Measure the species composition and structure of the DCSS vegetation community, and measure species composition and cover of native and non-native plants at various distances from the edges of the HCA to characterize the vegetation community to guide non-native removal management actions.

A.1 Methods

A pilot research study to collect DCSS attribute data was first initiated in 2004, which included point intercept transects stratified across the HCA. In 2009, CNLM changed the methodology and initiated a study to track the changes in species richness, structure and composition of the DCSS community using plots and transects (Appendix C). Our methodology was amended in 2010 to include a "rotating panel" approach to sampling. This approach incorporates visiting a subsample of all plots on a yearly basis, ensuring to balance the replicates according to aspect and to spread these replicates across the landscape in order to capture variation in weather that may take place across our sample region. All other plots are revisited every three years. CNLM was able to establish 15 plots and collect data from 9 of those plots in 2009. During 2010 an additional 5 plots were established and data were collected from 9 plots (3 of which are repeats with data collected in 2009 and 2010). To date, 20 plots have been established and data have been collected from 15 plots. Additional plots will be established and data collected over the next five years.

Table 7: Status of Addressing Previous Management Objectives

Community or Species	Objective (Obj.) or Goal	Completed (y/n);Year Completed; Notes
DCSS	Obj. 1: Measure the species composition and structure of the DCSS vegetation community.	Y, 2009 & 2010 (Quantitative method developed, implemented, and data collected, but not analyzed)
	Obj. 2: (not identified in previous HMP) - Update vegetation community mapping.	Y, 2010 (Re-mapped all vegetation communities at the Greens)
Sensitive Birds and the Bird Community	Obj. 1: Measure richness, abundance and distribution of the sage scrub bird community.	Y, 2006
	Obj. 2: Track CAGN, Bell's sage sparrow and grasshopper sparrow abundance, distribution and status.	Y, 2007, 2010 (Presence/absence CAGN surveys conducted and other sensitive avian species observed and mapped)
San Diego Horned Lizard, Spade-foot Toad and Orange-throated Whiptail and Other Reptile and Amphibian Species	Goal 1: Conduct research activities for coast horned lizard.	Y, Argentine ant abundance measured in 2005 and 2006. Project was cancelled due to lack of funding, except for measuring the abundance of Argentine ants.
	Goal 2: Locate breeding sites for spadefoot toads.	N, Project was cancelled due to lack of funding
	Goal 3: Determine the distribution and abundance of San Diego horned lizard, orange-throated whiptail and spadefoot toad, as well as other reptiles and amphibians.	N, Project was cancelled due to lack of funding
Wildlife Corridors	Goal 1: Track wildlife movement through wildlife corridors.	Y, 2005-2010 (Wildlife tracking and wildlife camera installation and monitoring occurred)
Thread-leaf Brodiaea, San Diego Thornmint and Non-native/Native Grassland Community	Goal 1: Manage the population thread-leaf brodiaea and San Diego thornmint by monitoring the percent cover of native and non-native annual plant species and by removing non-native plant species.	Y, 2006-2010 (Quantitative habitat assessments implemented in TLB and SDTM habitat; TLB non-native grassland management research project implemented and data collected; weeds controlled and removed in TLB habitat; and population surveys conducted).
Other Sensitive Plants	Goal 1: Monitor and map sensitive plant species.	Y, 2005-2010 (Annual sensitive plant surveys conducted)

A.2. Results

The total vegetative cover for all sampled transects averages 90%. Of this total, 39% is composed of non-native plants and the remaining 51% is composed of native plants. The dominant native species in the DCSS community is black sage (19% of the total, native plant cover (51%) is black sage) (Figure 10). California buckwheat (4%), golden yarrow (*Eriophyllum confertiflorum*) (3%) and lemonade-berry (*Rhus integrifolia*) (2%) are the most common perennial associate plants in this community. The most common native annual plant in the community is rattlesnake weed (*Daucus pusillus*) (4% of the total, native plant cover (51%) is rattlesnake weed) and granny's hairnet (*Pterostegia drymarioides*) (3% of the total, native plant cover (51%) is granny's hairnet). Non-native, annual grasses compose the largest percent of the non-native cover at 24%, out of 39% total non-native plant cover (Figure 10). Six-weeks fescue (*Vulpia myuros*) is the most dominant of these non-native grasses. Non-native forbs such as long-beak filaree (*Erodium botrys*) and smooth cat's-ear (*Hypochaeris glabra*), although commonly encountered, are not as common as the non-native grasses.

Species richness data and dead shrub counts have also been collected in the DCSS monitoring plots, but those data have not yet been analyzed. Species richness may be a proxy for measuring and determining the effects on plants from global climate change. Species that currently inhabit the drier, warmer, south-facing slopes, may over time, disappear from these south-facing slopes as the temperature increases. Or, these species may migrate to the northern-facing slopes as the southern and northern facing slopes become warmer and drier as the climate warms. The species that currently grow on the cooler, shady, north –facing slopes, may be extirpated as the temperate increases thereby making the habitat unsuitable to these species that require cooler and moister conditions, which currently are found on the northern-facing slopes.

B. Sensitive Birds and the Bird Community

Goal 1. Measure changes in species richness, abundance and distribution of the sage scrub bird community.

Goal 2. Track changes in the abundance, distribution and status (pair, unpaired) of CAGN, Bell's sage sparrow and grasshopper sparrow.

B.1. Methods

Goal 1.

In 2003, CNLM set up six, 50-acre units for bird studies (CNLM, 2003). The number of points in each unit was increased from 6 to 9, in 2004 and each point was separated by at least 75 meters (from the center). In 2004, only four of the units (all in CSS) were monitored. No time was available to monitor the chaparral units. Each bird point count location was visited three times during the spring for 10 minutes each visit. The surveyor recorded all birds observed from 0-50 meters from the point in 0-3, 3-5 and 5-10 minute intervals.

In 2006, the monitoring methodology was revised because statistical analysis of the 2003 data indicated that the bird community monitoring needed to focus on a suite of perhaps five or six species since insufficient acreage was available to accommodate the number of necessary point locations. Data analysis also suggested adding more points where possible. Thus, in 2006, CNLM used the 24 point locations from previous years' work and added 24 additional points for a total of 48 points. All points are within DCSS. In 2006, the sampling methodology was modified as well. CNLM recorded all birds observed or detected in three, 3-minute intervals and used a taped vocalization of the CAGN for 30 seconds prior to each interval. The goal of using the taped vocalization was to determine if there would be an increase in the detection probability of CAGN and therefore, a reduction in the number of visits required. The USFWS has tested a similar protocol but did not use a taped vocalization. The USFWS analysis of detection probabilities determined that their survey protocol would require 5 visits to each point and six, 3-minute intervals per visit to have a 75-80% likelihood of detection. CNLM believed that we could

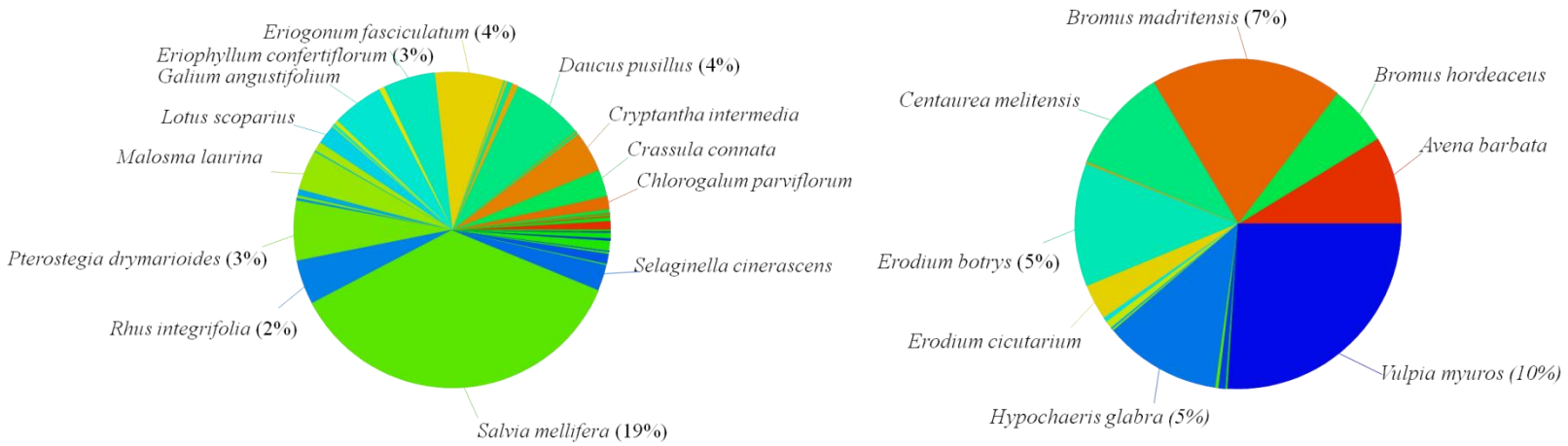

Figure 10- Native and Non-native Relative Plant Cover by Dominant Species (2009 and 2010)

decrease the number of visits and time spent on each point per day by playing a taped vocalization and possibly obtaining similar results. CNLM visited each point twice during the 2006 breeding season.

Goal 2.

USFWS protocol presence/absence surveys were conducted for all CAGN surveys and surveys were conducted by a biologist that was approved by the USFWS and the CDFG to survey for CAGN. USFWS protocol CAGN surveys require that three visits be conducted per site. However, in some cases, only two visits were made if it was determined that only one pair of CAGN could possibly occupy the surveyed location, or conversely, four or five surveys were conducted if the surveyor was still trying to determine the number of CAGN pair in a survey location.

The other sensitive avian species, Bell's sage sparrow and grasshopper sparrow, were recorded by location, when observed.

B.2. Results

Goal 1.

Although the bird community survey effort provided interesting data about bird diversity, distribution and abundance, the project was cancelled as it was determined that the study had little statistical power to detect change or trends over time. CNLM would need more acreage to continue this survey effort. Refer to the previous HCA HMP for additional information (CNLM, 2005).

Goal 2.

All CAGN presence/absence survey results are discussed in Section III.D.

C. San Diego Horned Lizard, Spade-foot Toad and Orange-throated Whiptail and Other Reptile and Amphibian Species

Goal 1. Conduct research activities to learn more about the diet, distribution and threats to San Diego horned lizard

Objective 1. Continue to document San Diego horned lizards abundances and distribution.

Objective 2. Measure the abundance of Argentine ants at varying distances from the edge of the HCA.

Objective 3. Determine whether counts of harvester ant colonies is a feasible method to track changes in San Diego horned lizards.

Goal 2. Locate breeding sites for western spadefoot toads (*Spea hamondii*).

Goal 3. Determine the distribution and abundance of San Diego horned lizard, orange-throated whiptail and western spadefoot toad, as well as other reptiles and amphibians.

C.1. Methods

Goal 1.

Objective 1. San Diego horned lizards were documented and mapped when observed during all HCA activities.

Objective 2. In 2006, 28 ant pit cups (10-ounce beer cup filled with antifreeze) were placed along randomly placed 50 meter long vegetation transects that were set up in 2005. Vegetation transect location varies based on past and present disturbance, fire history and the distance from the edge of the HCA. At

each transect, one ant pit cup was placed at the 1 and 49-meter marks of a 50-meter tape. The cups were left in the ground for one week in 2006 (June 5 to June 12).

Objective 3. Methods are not provided for this objective because the project was cancelled due a lack of funding.

Goal 2. Methods are not provided for this objective because the project was cancelled due a lack of funding.

Goal 3. Methods are not provided for this objective because the project was cancelled due a lack of funding.

C.2. Results

Goal 1, Objective 1.

During the last five-year period, San Diego horned lizards were observed only on the University Commons on-site parcel adjacent to and above the Brouwer Quarry (Figure 9). One adult was observed above the quarry and two adults were observed mating adjacent to the quarry on the Hubbard Slope restoration project. Although these sightings are considered very low for this species, previous data reveal that San Diego horned lizards do occur with more regularity in other areas, such as Denk Mountain and the west Ridgeline Trail area (CNLM, 2011).

Goal 1, Objective 2.

Only one ant pit cup of the 28 sampled contained Argentine ants. Most of the pit cups contained native ants. Four Argentine ants were located in the cup that contained them. This cup was located about 250 feet from Camino Junipero Street in an area dominated by non-native grasses. Although these results are only preliminary, it is good to know that Argentine ants have not invaded the majority of the HCA. They appear to remain close to developed areas (edges of the HCA).

D. Wildlife Corridors

Goal. Track wildlife movement through wildlife corridors.

D.1. Methods

Wildlife movement has been tracked over the past five years using wildlife cameras positioned in strategic locations (i.e., near game trails and road undercrossings). The goal was to understand and study trends in wildlife movement at "pinch point" locations and movement corridor locations. The MHCP Management and Monitoring Plan outlines several locations of interest for wildlife movement studies in northern San Diego County, of which only one is near or within a CNLM preserve. That location is:

- [CNLM Reference #SMC 1] San Marcos Creek (SMC) at Rancho Santa Fe Road Wildlife Undercrossing Bridge (connects La Costa Villages HCA area in Carlsbad with University Commons HCA area in San Marcos)

CNLM has located several other areas of interest for wildlife movement tracking in the HCA. These areas are described below:

- [CNLM Reference #SMC 2] San Marcos Creek at Melrose Road Wildlife Undercrossing Bridge (connects La Costa Villages HCA area in Carlsbad with University Commons HCA area in San Marcos and is about half-mile upstream of the Rancho Santa Fe Wildlife Under-crossing Bridge (#SMC 1).

- [CNLM Reference #SMC 3] San Marcos Creek near the west end of Box Canyon and Gibralter Street. This connects Box Canyon to the La Costa Golf Course (which connects to Batiquitos Lagoon).

- [CNLM Reference #RSF 1] Rancho Santa Fe (RSF) Road Wildlife Under-crossing Tunnel (connects HCA areas on the eastern and western sides of Rancho Santa Fe Road about half mile south of the intersection of San Elijo Road and Rancho Santa Fe Road).

- [CNLM Reference #EF 1] Elfin Forest (EF) unnamed tributary creek to Escondido Creek. A small, narrow riparian strip of oak/sycamore woodland that serves as a movement corridor in Elfin Forest (about one quarter mile west of the intersection of Suerte del Este and Canyon de Oro in Elfin Forest.

- [CNLM Reference #HC 1] Hidden Canyon (HC) Wildlife Corridor. This area is located in the southeastern most portion of San Marcos, and connects CNLM land in Carlsbad and San Marcos (La Costa Villages and University Commons) to Elfin Forest, Harmony Grove and Escondido.

- [CNLM Reference #DKN 1] Denk Tank (DKN) North Corridor along Vallecitos Water District (VWD) water reservoir. Located from the RSF under-crossing to about 250 meters east along the VWD fence line. This is a "leader" path to and from the RSF under-crossing.

CNLM's HMP (CNLM, 2005a) focused primarily on mammalian predators, such as grey fox (*Urocyon cinereoargenteus*), mountain lion (*Felis concolor*), bobcat and coyote (*Canis latrans*). However, we are also documenting other use of these movement areas to include southern mule deer and raccoon (*Procyon lotor*). The following questions were asked in conjunction with these locations:

1. What mammalian predators are using the corridor areas described above?
2. What is the frequency and temporal variation of mammalian predator use of these corridors?
3. How does the mammalian predator use of these areas change over time?
4. What are the characteristics of each wildlife movement area and how might that affect movement?

Although efforts were made to monitor each potential movement point, it turned out to be difficult to establish permanent tracking stations at each point, as wildlife cameras were exposed to people, who would in-turn, vandalize the cameras. It was decided that monitoring at DKN 1, HC 1, and EF 1 would provide sufficient data to determine the type and level of mammalian use. Unfortunately, in the last year, cameras have been stolen at EF 1, so this location may be removed from our study. SMC 1 was monitored once in 2007; however the monitoring in this area was discontinued due to the high visibility of the area to the public and fear that the camera would be stolen. After five years of pilot work using wildlife cameras, it was decided to run the cameras for four, 2-month periods, with each period being during a different season of the year. The digital remote-sensing cameras record the date and the time of each photograph allowing for the quantification of movement in any given month. The cameras are set to take a photograph every 30 seconds so as to capture as much wildlife movement in an area as possible. Photographs taken using digital, remote-sensing wildlife cameras were reviewed and data compiled over the past five year period.

D.2. Results

Over the last five years we have sampled four sites and have used these data not only to evaluate movement patterns, but also to develop a better and more standard monitoring approach. For example, during the first several years of monitoring, the cameras were not used as often as the last two years of monitoring. This resulted in an increase in wildlife photographs captured at each camera location over the last two years (Table 8). These data are important for long term trend analysis and provide further proof that HCA contains habitat to support medium and large-sized mammals.

Wildlife activity recorded at DKN 1, HC 1, EF 1, and SMC 1 using wildlife cameras is summarized in Table 8. Our data suggests that these locations do function as wildlife movement locations as expected and will be important for future study. In summary, most movement, as expected, is at night or very early in the morning. There is a generally consistent amount of movement at each camera location and by species. Primary species observed at all

Table 8: Wildlife Camera Photographs by Location, Year and Species

Year	HC1				DNK1						EF1				SMC1
	Species*				Species*						Species*				Species*
	Bobcat	Mule Deer	Coyote	Raccoon	Bobcat	Mule Deer	Coyote	Cotton Tail Rabbit	Jack Rabbit	Squirrel	Bobcat	Mule Deer	Coyote	Raccoon	Mule Deer
2006[1]	1	5	5	1		6					11	1	6	1	
2007[2]	1	7	4			4	1					1	11	10	1
2008[3]															
2009[4]		9	3		2	16	14	8							
2010[5]	2	47	22		3	16	33	12	2	1	1	67	13		
Total	**4**	**68**	**34**	**1**	**5**	**42**	**48**	**20**	**2**	**1**	**12**	**69**	**30**	**11**	**1**

*** Number provided under each species is the number of photographs taken of each species at each location by year.**

1. Days of monitoring not quantified.

2. 31 days of monitoring for HC1, 36 days of monitoring for DNK1, 37 days of monitoring for SMC1 and 25 days of monitoring for EF1.

3. No data, due to camera theft and vandalism.

4. 42 days of monitoring for both HC1 and EF1.

5. 161 days of monitoring at HC1; 134 days of monitoring at DNK1 and 152 days of monitoring at EF1.

locations are mule deer and coyote. Bobcat has been observed at the three main monitoring locations as well and other species such as raccoons and rabbits have been observed in the vicinity of the cameras. There is also generally an equal amount of movement either into or out of the preserve (HC 1), or up or downstream (EF 1) or toward or away from the wildlife undercrossing (DKN 1).

E. Thread-leaf Brodiaea, San Diego Thornmint and Non-native/Native Grassland Community

Goal. Manage the population TLB and SDTM by monitoring the percent cover of native and non-native annual plant species within its habitat and by removing non-native plant species.

E.1. Methods

E.1.1 Thread-leaf Brodiaea

Population Survey Methods

Direct counts for flowering TLB occurred in 2006, 2008 and 2009 and an estimation was performed in 2005 (see Section E.2.1. for results and Table 4). Vegetative TLB surveys, in research plots, also occurred in 2007, 2008, 2009, and 2010.

Quantitative Monitoring

In 2004, CNLM began a pilot study on the Greens parcel where several thousand TLB had originally been documented. That goal was to determine if de-thatching could improve TLB habitat and reduce the threat of non-native grasses on the species. After a few years of monitoring, it was determined that the plots were too large (and few TLB were counted within quadrats) and that a method using vegetative counts versus just flowering counts was needed. In addition, CNLM staff had conversations with Carl Bell (personal communication, 2006), who mentioned that a grass specific herbicide, likely would not impact TLB if used according to label directions. Thus, in 2006 the research study was modified after obtaining permission from the CDFG via a Memorandum of Understanding (MOU). This MOU allowed CNLM staff to spray a grass-specific herbicide on TLB vegetative individuals to try to control the non-native grasses in the occupied habitat. The management goal was to maintain a healthy, stable population of TLB, increase TLB numbers, and decrease the percent cover of non-native grasses, specifically purple-false brome. The objective of the study is to quantify the cover of non-native and native plant species, document changes in TLB density, and implement de-thatching and herbicide applications to determine if dethatching and/or herbicide application can help reduce non-native cover and improve TLB habitat and individual rigor. Data were collected and weed management techniques were tested in 2007 and 2008. In 2009 and in 2010, the methodology was modified based on the time spent collecting data during the 2008 and 2009 survey years (Appendix D, Methods Section).

Weed Management

Weeds have been controlled in occupied TLB habitat throughout the last five years using herbicide application and line trimmers.

E.1.2 San Diego Thornmint

Population Survey Methods

Direct counts for SDTM have occurred annually aside from the original population estimation that occurred in 2003 (see Section E.2.2. for results and Table 4).

Quantitative Monitoring

A long-term monitoring methodology was established and implemented in 2009 and 2010 to monitor the SDTM occurrence located at the Greens. The objective was to maintain a healthy and stable SDTM occurrence. The management goal included determining the species and edaphic composition in the occupied SDTM habitat and to detect negative or positive trends in these conditions within the occupied habitat. A stratified random sampling methodology was utilized within the occurrence (Appendix E). Monitoring transects were randomly placed within the previously demarcated boundaries of the occurrence and six quadrats were randomly placed along these transects and data were collected within each quadrat. Each quadrat contained 36 points for a total of 216 points (6 quadrats x 36 points = 216 total points) within the occupied SDTM habitat. The following attribute information was collected within each of the quadrats during the 2009 fiscal year: percent cover (collected at each point within the 6 quadrats) , diversity (within the total area encompassed by each quadrat), and the number, height, and verticillaster count for each SDTM plant located in each quadrat. During the 2010 fiscal year, height and verticillaster data were not collected.

E.2. Results

E. 2.1 Thread-leaf Brodiaea

Population Survey Results

Direct flowering counts occurred for the TLB occurrences located at the Greens in 2006, 2008, and 2009. In 2006, only 83 flowering individuals were counted (low rainfall), approximately 8,291 flowering individuals were counted in 2008, and an additional 14 flowering individuals were located and counted in 2009, for a total flowering count of 8,305. Originally 7,000 plants were estimated to occur at the Greens based on the original biotechnical reports prepared for the HCA (USFWS, 1995) that was likely determined by flowering counts.

Vegetative surveys for this species reveals that a much higher TLB population actually occurs at the Greens than previously estimated. Flowering counts have occurred since 2006, as mentioned above, but vegetative counts, began in 2007, as part of the quantitative TLB research project that was conducted at the Greens. Our study revealed that vegetative TLB surveys conducted in January/early February will yield a more accurate population count than surveys conducted in May, or during the flowering stage for TLB. Surveying for and relying on flowering TLB count numbers will yield an inaccurate population number (Table 9). The vegetative counts in the TLB research study macroplots revealed that over 29,000 TLB occur within the macroplots. Conversely, the flowering count in these same study macroplots has been zero (2007) (low rainfall year). TLB percent flowering in the study macroplots has ranged from 0 to 14%. Based on this information, it is fairly safe to assume that more than 50,000 TLB actually occur at the Greens.

The species appears well protected, however; threats including non-native grasses and forbs and soil saturation from adjacent, irrigated and landscaped slopes are threats.

Quantitative Monitoring Results

A brief discussion of the results is presented below. A more comprehensive study report provided under a separate cover includes a detailed discussion of the results (Appendix D).

Based on the preliminary results from the project, the grass-specific herbicide, *Fusilade II*©, does not appear to kill or harm TLB when applied correctly and following label directions. Additionally, after three years of *Fusilade II*© and dethatching treatments in one of the study macroplots (Macroplot 3 [see Appendix D]) for further discussion regarding the Macroplots), there has been a reduction in non-native grasses and non-native grass litter accumulation and an increase in non-native forbs, native forbs, and bare ground. TLB vegetative to flowering response in the herbicide and herbicide/dethatch treatment subplots in Macroplot 3 does not appear to vary significantly from controls, although the variation among dethatch treatments is quite high, indicating some plots have experienced increasing counts since treatments began. TLB scape length has increased significantly in the herbicide treatment

Table 9: Thread-leaf Brodiaea Density and Percentages

Year	Attribute	Macroplots			BRFIL Totals
		1	**2***	**3**	
2007	Total BRFIL Vegetative Density	5951	7147	1275	14373
	Total BRFIL Flowering Density	0	0	0	0
2008	Total BRFIL Vegetative Density	13445	13508	2636	29589
	Total BRFIL Flowering Density	3500	319	419	4238
2009	Total BRFIL Vegetative Density	15678	10943	2532	29153
	Total BRFIL Flowering Density	133	6	161	300
2010	Total BRFIL Vegetative Density	11,388	N/A	2928	14,316
	Total BRFIL Flowering Density	1,014	N/A	618	1,632
		Macroplots			
		1	**2**	**3**	**Total Percent Flowering by Year**
2007	Percent Flowering BRFIL	0%	0%	0%	0%
2008	Percent Flowering BRFIL	26.0%	2.4%	15.9%	14.3%
2009	Percent Flowering BRFIL	Less than 1%	Less than 1%	6%	1%
2010	Percent Flowering BRFIL	8.9%	N/A	21.1%	11.4%

*Individual TLB in this study plot were impacted by rabbit herbivory, which resulted in fewer flowering individuals.

subplots. We see an increase in the proportion of counts with multiple scapes among the herbicide treatments as well, and this pattern seems to lend support to our scape length increases observed in these treatments. The scape length increase in the herbicide treatment subplots is contrary to our hypothesis that scape length would be highest in the herbicide/dethatch treatment subplots, but time will tell if this is a definitive pattern. The higher scape length in the herbicide treatment subplots may be a result of the fact that the litter accumulation in the herbicide treatment subplots holds moisture in the ground longer allowing for TLB access to moisture for longer periods of time. Additionally, this pattern could possibly be due to the fact that non-native forb cover is much lower in the herbicide treatment subplots when compared to the herbicide/dethatch treatment subplots, again, allowing for TLB to access the available resources instead of competing for those resources with the non-native forbs that compose a high percent cover in the herbicide/dethatch subplots.

Weed Management

The following weeds have been controlled throughout the TLB occupied habitat over the past year five-year period: artichoke thistle (*Cynara cardunculus*), fennel, black mustard, and Italian thistle. Herbicides were used to control the artichoke thistle and the fennel. Line trimmers were used to control the black mustard and the Italian thistle. These species have not been eradicated from the occupied habitat, but occur at reduced levels since control of these species began.

E.2.2 San Diego Thornmint

Population Survey Results

Approximately 380 plants were located in 2010 compared to 251 plants in 2009 and 194 plants in 2008 (Figure 8). This occurrence will be monitored and managed annually in the future, and appropriate management actions will be taken should the occurrence appear to be in decline. The species appears well protected, however; some current threats include habitat loss due to non-native forb and grass invasion or clay lens impacts (e.g., anthropogenic impacts). Additionally, a threat could include the loss of plants and the soil seed bank should a fire burn through the occupied habitat in spring.

Quantitative Monitoring Results

Total plant cover within the SDTM occupied habitat increased from 2009 to 2010 for both native and non-native forbs. In 2009, total plant cover was only 19% and in 2010 total plant cover was 39%. Nearly non-overlapping confidence intervals suggest a substantive and almost statistically significant difference in native and non-native forb cover from 2009 to 2010 (Figure 11). There also appears to be a significant difference between non-native forb cover and non-native grass cover from 2009 and 2010 (Figure 11). Non-native forb cover increased, while non-native grass cover was slightly reduced in 2010. The non-native forb cover was primarily composed of tocalote in both 2009 and 2010 (Figure 12), but non-native grass dominance shifted from purple false brome in 2009 to red brome (*Bromus madritensis* ssp. *rubens*) in 2010 and was lower in total percent cover.

Twenty plant species were located within the sampled occupied habitat in 2009 and 16 were located in 2010. The species richness between years decreased slightly and there appears to be no obvious explanation for the decrease aside from sampling quadrat placement. The random placement of the sample plots from year to year yielded a lower species richness, just by chance. An average of 9.5 thornmint plants were located in the sampled occupied habitat in 2009 and an average of 12.8 thornmint plants were located in 2010, a slight increase, possibly due to an increase in precipitation.

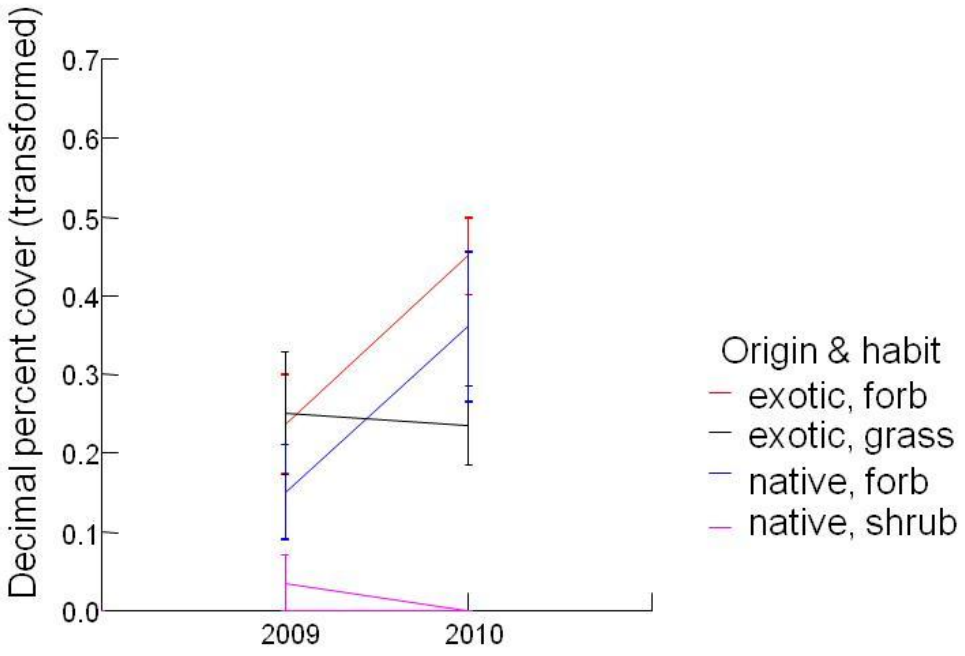

Figure 11 - Percent Cover by Origin and Habit in San Diego Thornmint Habitat

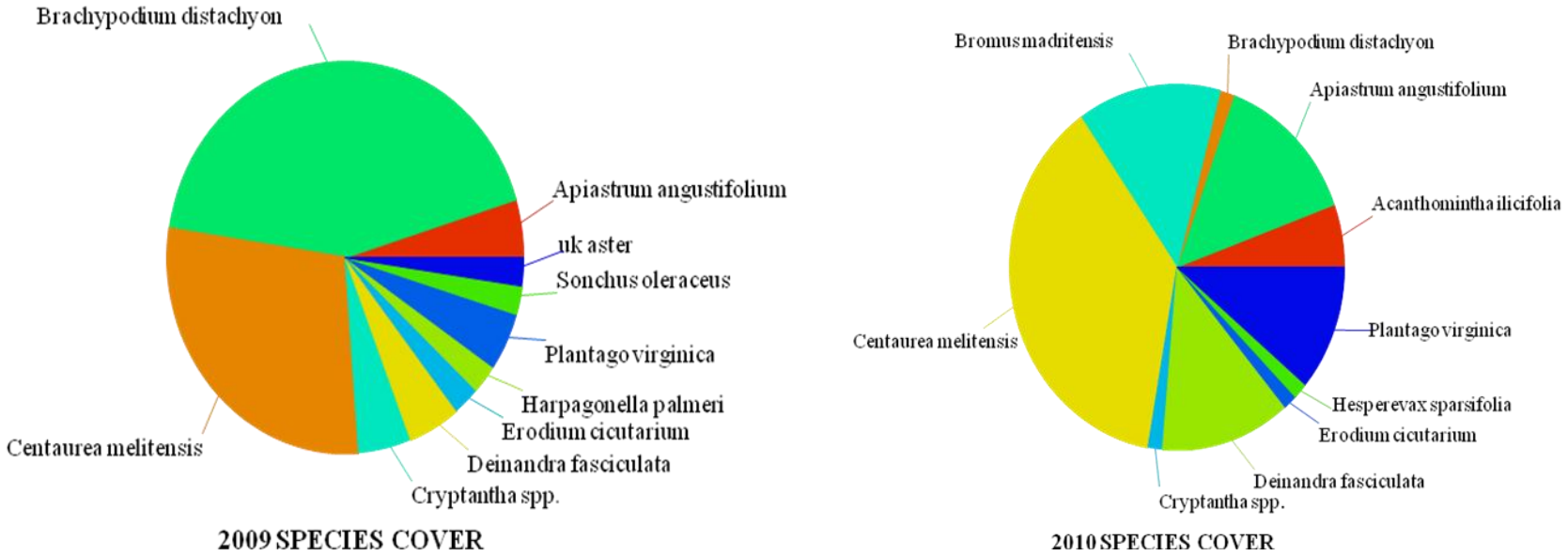

Figure 12 - Species Cover in San Diego Thornmint Habitat (2009 & 2010)

F. Other Sensitive Plants

Goal 1. Monitor and map sensitive plant species.

F.1. Methods

Surveys for other sensitive plants occurred between 2007 and 2010. Direct counts and/or population estimations were utilized for each sensitive plant species and all occurrences were mapped (Figure 8). The survey methodology for all of the sensitive plants surveyed are included below.

Orcutt's Brodiaea

Direct counts occurred for the Orcutt's brodiaea (*Brodiaea orcuttii*) occurrences in 2008. Additional plants were located and translocated in 2010 as part of an off-site project mitigation requirement (CNLM, 2010).

Del Mar Manzanita

See Section III.D. for the DMM monitoring methodology.

Wart-stemmed Ceanothus

Direct counts and population estimates occurred for wart-stemmed ceanothus in 2008. The population estimates were based on measurements in the field (i.e., Choumass-Pappas – 11 plants per 5 meters by 5 meters; Frank's Peak - 18 plants per 5 meters by 5 meters; Huff – 15 plants per 1.5 meters by 1.5 meters for thickly covered areas and 10 plants per 10 meters by 10 meters for sparsely covered areas; and Brouwer Quarry – 20 plants per 5 meters by 5 meters for thickly covered areas and 15 plants per 5 meters by 5 meters for moderate to sparsely covered areas) and that number was extrapolated across the acreage of the polygon occupied by wart-stemmed ceanothus.

Nuttall's Scrub Oak

Direct counts and population estimates occurred for Nuttall's scrub oak (*Quercus dumosa*) in 2008 and in 2010. Population estimates were based on measurements in the field (i.e., 4 plants per 3 meters by 3 meters at the Greens) and then that number was extrapolated across the acreage of the polygon occupied by Nuttall's scrub oak.

Summer Holly

Direct counts, to the extent possible, occurred for summer holly (*Comarostaphylis diversifolia* ssp. *diversifolia*) in 2008.

Sticky Dudleya

Direct counts, to the extent possible, occurred for sticky dudleya (*Dudleya viscida*) in 2008. Some estimations were made in cases where the sticky dudleya were inaccessible (i.e., cliff walls).

San Diego Goldenstar

Direct counts for San Diego goldenstar (*Bloomeria clevelandii*) occurred in 2009.

Orcutt's Hazardia

See Section III.D. for the OH monitoring methodology.

Engelmann Oak

Engelmann oak (*Quercus engelmannii*) trees were counted in 2010.

Southwestern Spiny Rush

Surveys for southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*) occurred in 2008 and in 2010, several more individuals were located. Direct counts were conducted for this species, but since this species can occur in large clumps, the reported population number is likely an estimation of the true population size. Additionally, surveys for this species have not been finished.

Chocolate Lily

One new chocolate lily (*Fritillaria biflora* var. *biflora*) occurrence was located in 2010 and direct counts for the occurrence were taken.

San Diego Sagewort

Several new occurrences of San Diego sagewort (*Artemisia palmeri*) were located on the Elfin Forest off-site parcel in 2010. An exact count was not taken and estimations of the occurrences were made instead.

San Diego County Sunflower

One San Diego County sunflower (*Bahiopsis laciniata*) occurrence was located in 2009. Direct counts were taken of this occurrence.

San Diego Marsh-elder

In 2008, surveys were conducted for San Diego marsh-elder (*Iva hayesiana*) in Box Canyon, but the entire HCA was not surveyed. This species also occurs at the Greens.

Golden-rayed Pentachaeta

The golden-rayed pentachaeta (*Pentachaeta aurea*) occurrence was located in 2009, but was not counted. It was only mapped.

F.2. Results

Orcutt's Brodiaea

Approximately 814 plants were counted during the flowering surveys at the Winston parcel in 2008 (Figure 8). Many of these individuals were transplanted to this location as part of the University Commons mitigation requirements. 2008 was the first year that the Orcutt's brodiaea was counted by CNLM staff in the transplant and extant occurrences located on the Winston parcel. The Winston parcel supports both transplanted and extant, naturally occurring Orcutt's brodiaea populations. As part of the mitigation for the University Commons residential development, 2,233 Orcutt's brodiaea corms were transplanted to the Winston parcel. The success criteria required that at least 50 percent of the population flower over the five-year maintenance and monitoring period. Dudek and Associates performed the monitoring and maintenance of the population and in 2004, 1,149 flowering Orcutt's brodiaea were counted in the transplanted population. No further counts were performed by Dudek after 2004, since success criteria had been reached.

A population from the City of San Marcos (Pacific Street) was translocated in 2010 to the Winston parcel. The transplanted occurrence was planted near extant and other transplanted occurrences. No known extant occurrences

were located in the area where the transplanted individuals were placed. Approximately 320 Orcutt's brodiaea corms were transplanted onto the Winston site as part of the Pacific Street translocation project, but only 163 vegetative individuals were counted in 2010, a couple of months after the transplantation occurred, and of those 163 individuals 54 were flowering (approximately 33 percent of the vegetative occurrence flowered). It appears that the transplantation was successful as both vegetative and flowering individuals were observed, but only half of the transplanted corms appear to have survived to produce vegetative matter.

Approximately 451 flowering individuals were located in Elfin Forest in 2008 (Figure 8). The 451 plants located and counted at Elfin Forest is a large increase from the previous population count of 200 individuals located in 2003 (which was an estimate). Another 6 individuals were located on the east Ridgeline Trail area and University Commons on-site, just north of San Elijo Road in 2010. The total flowering count thus far for all occurrences (natural and translocated) is 1,325 individuals. Additional plants have been located in other areas during past survey efforts, such as Denk Mountain. The species appears well protected and no current threats, aside from the non-native grasses and Italian thistle, have been identified.

Del Mar Manzanita

See Section III.D. for the DMM monitoring results.

The species is well protected and no threats to the species require attention at this time. It should be noted, however that no DMM seedlings were located, which may need to be studied in the future. If this trend continues, it may be necessary to figure out how to get seedlings to establish within the HCA (e.g., fire, manual scarification and/or stratification).

Wart-stemmed Ceanothus

Approximately 1,384,056 wart-stemmed ceanothus are estimated to occur (Figure 8). Direct counts occurred at the Greens and population estimations occurred everywhere else using the method described in Section IV.F.1. Approximately 54 individuals occur at the Greens. Approximately 1,152,351 individuals are estimated to occur on the Huff parcels located in Hidden Canyon; 140,803 individuals are estimated to occur at the Brouwer Quarry, 75,599 individuals are estimated to occur at Frank's Peak and 15,249 individuals are estimated to occur at Choumass-Pappas. This is the first time a true population count or estimation has occurred for this species. The species is well protected and no threats to the species require attention at this time. It should be noted, however that we noticed saplings and younger shrubs located in areas that had recently burned (i.e., 1996 Harmony Grove Fire). Additionally, the population count was much higher in these recently burned areas as opposed to other areas that have not burned recently. No seedlings (and only several young shrubs) were located at the Greens. CNLM was unable to determine when the last fire burned the portions of the Greens occupied by the wart-stemmed ceanothus as there were no data for this area. As with DMM, if seedlings and young shrubs become noticeably absent from the Greens population, it may be necessary to figure out how to get seedlings to establish within the HCA (e.g., fire, manual scarification and/or stratification).

Nuttall's Scrub Oak

Approximately 8,906 Nuttall's scrub oak were located at the Greens in 2008 and another 18 individuals were located at the Greens and lower Box Canyon in 2010 for a total of 8,924 individuals (Figure 8). This estimation is rather high and a more accurate quantitative methodology to estimate the population during the next set of surveys for Nuttall's scrub oak may be needed. The species is well protected and no threats to the species require attention at this time, aside from the potential threat of an altered fire regime. Seedlings and saplings of *Quercus* species were located during the surveys, but it was not possible to determine the specific epithet.

Summer Holly

Approximately 254 plants were located in 2008, and the majority of plants are located at the Greens and the Cassia parcels (Figure 8). Historical estimates range from 460 plants to "hundreds" (CNLM, 2003). The drop in the population count is a result of differing methodologies (estimation vs. direct count). The 2008 count is likely closer to the true population number. The species is well protected and no threats to the species require attention at this time, aside from the potential threat of an altered fire regime.

Sticky Dudleya

Approximately 6,280 plants were located in Box Canyon in 2008 (Figure 8). Several threats were identified for sticky dudleya at the time of the surveys. First, pampas grass was growing is several areas occupied by sticky dudleya; however, all of this pampas grass was treated in 2009 and is therefore no longer considered a threat. Continued management of pampas grass will be necessary however to ensure that pampas grass does not threaten any sticky dudleya occurrences in the future. Secondly, several sticky dudleya were torn away from the rocks where it was growing by trespassers that hike down into the canyon. These dudleya were growing along rocks that the trespassers hike on, thus kicking the dudleya out of the rock as they climb and walk over the rocks. Trespassing in Box Canyon is discouraged by signage, public outreach, active patrols and the City of Carlsbad Police Department. However, trespassers will not kill enough sticky dudleya to impact the occurrence (only several plants were noted this past year and the majority of the plants are located on cliff faces that are inaccessible).

San Diego Goldenstar

Approximately 1,271 plants were located west of old Rancho Santa Fe Road (Figure 8) and 50 plants were located on the Elfin Forest off-site parcel (Figure 8) in 2009. The 2009 counts are less than the previous population estimates made in 2003.

The fewer San Diego goldenstar observed than in previous years is most likely due to the fact that the species is a corm bearing species and flowering is highly dependent upon timing and amount of precipitation. CNLM did observe that other corm bearing species (i.e., thread-leaf brodiaea) also exhibited lower flowering numbers in 2009 when compared to 2008.

This species appears well protected and no current threats, aside from the non-native forbs and grasses, have been identified. However, one such forb, crete hedypnois does appear to be a significant threat. This species tends to colonize clay soils very rapidly, quickly outcompeting all other vegetation, including other non-native species. This species will be treated in the future.

Orcutt's Hazardia

See Section III.D. for the OH monitoring results.

Engelmann Oak

Three Engelmann oak trees were located in 2010 growing on the Greens parcel (Figure 8). One individual had been noted previously by the Preserve Manager, but had not been mapped. Additionally, one of these three individuals had been mapped as part of the original biological surveys conducted for the Fieldstone/La Costa Development Project. It was assumed that this individual had been impacted during development, but it is now known that this individual was not impacted. All of the individuals are growing within coast live oak woodlands. Two of the individuals are adults and one individual is considered a sapling.

Southwestern Spiny Rush

Approximately ten southwestern spiny rush individuals were located in 2010 in lower Box Canyon, southwestern Denk Mountain and the Elfin Forest off-site parcel (Figures 8). In 2008, surveys were conducted for southwestern spiny rush by the Preserve Manager, but the entire HCA was not surveyed. Approximately 542 individuals were located during those surveys. Approximately 552 individuals have now been located, but since the entire HCA has not been surveyed yet, there are likely more individuals to locate.

Chocolate Lily

Twelve chocolate lily individuals were located adjacent to Alga Way in 2010 (Figure 8). Chocolate lily had not been previously found growing in the HCA. Although this species is not considered sensitive by any State or federal agency or the California Native Plant Society, it is a noteworthy species as it is considered uncommon in southern California and especially in northern San Diego County.

San Diego Sagewort

Greater than 150 individuals were located on the Elfin Forest off-site parcels in 2010. An exact count was not taken and many more individuals than 150 likely exist within the occurrence bounds.

San Diego County Sunflower

The occurrence contains approximately 100 individuals and was likely introduced during restoration practices as the occurrence is located within a SDG&E easement. This species is relatively uncommon in northern San Diego County and when found in northern San Diego County, is usually associated with a restoration or revegetation project. No other individuals have been observed growing.

San Diego Marsh-elder

Several small patches of San Diego marsh-elder were located in the southern portion of Box Canyon (Figure 8). The majority of San Marcos Creek, as it travels through Box Canyon, is lined with patches of San Diego marsh-elder.

Golden-rayed Pentachaeta

The occurrence is very large and co-occurs with San Diego goldenstar west of old Rancho Santa Fe Road in the vicinity of the east Ridgeline Trail area. A population estimation was not made for this species.

V. Ecological Models and Adaptive Management

A. Ecological Models

Ecological models are valuable tools to identify assumptions about how a particular habitat, landscape, or species could respond to natural and artificial perturbations. A model is essentially a theory and can be described using words, diagrams, computer programs, etc. While models reflect current knowledge, they are meant to be modified over time as our knowledge of, and experience with, a particular habitat or species changes. Models represent an assumption about how a particular habitat or species could respond to management practices and thus provide a rationale for the implementation of a particular management objective. Models also represent a testable hypothesis for inclusion in an adaptive management scenario.

The descriptive ecological models presented within this HMP focus on listing, describing and evaluating threats to plant communities, and sensitive plants and animals that rate the highest in importance for management and monitoring (Table 10). The term “threat” has been defined in many ways and various terms have been used in lieu

Table 10: HCA Threats

Threat	Locations	Size or Severity	Future CNLM Actions (Over Next Five Years)
Weeds			
Acacia trees (*Acacia* spp) NA	Riparian and upland areas throughout the HCA.	Unknown, but likely less than 10 trees.	Will cut as time and budget permit.
Onion Weed (*Asphodelus fistulosus*) M*	Located at the Greens and the Meadowlark Parcel	Low. Approximately 1 acre (at the Greens). Severe. Approximately 8 acres (at the Meadowlark Parcel). Severe. Approximately 8 acres at the Wilern Parcel.	Will treat as much as possible at both locations using the Transnet EMP Funding and CNLM funding when possible.
Hotentot fig (*Carpobrotus edulis*) H*	One patch.	Low. Patch is approximately ¼ acre in size.	Will eradicate within the next five years.
Ward's Weed (*Carrichtera annua*) H*	Located at the Greens.	Severe. Approximately 2 acres in size (2 occurrences).	Will treat until eradicated using the Transnet EMP Funding and CNLM funding.
Pampas grass (*Cortaderia* spp.) H*	Throughout riparian and in some upland areas.	Low. A few sprouts and small individuals.	Will continue to treat using Vallecitos Water District Mitigation funding and CNLM funding when possible.
Artichoke thistle (*Cynara cardunculus*) M*	Primarily at the Greens.	Low. No more than 10-20 plants.	Will eradicate within the next five years.
African Daisy (*Dimorphotheca sinuata*) NA*	Along Old Rancho Santa Fe Road and near the Winston parcel.	Moderate. ½ acre along Old Rancho Santa Fe Road.	No actions planned unless budget permits over five year period.
Fuller's Teasel (*Dipsacus sativus*) M*	Box Canyon.	Low. Approximately 20 plants.	Will treat using compensatory mitigation funding received from Morrow Development as part of USACOE regulatory permit sign-off obligation.
Perennial Veldt grass (*Ehrharta calycina*) H*	Two occurrences: the Greens and along Old Rancho Santa Fe Road.	Severe. Dense patches at the Greens covering about 2 acres; 1 acre located along Old Rancho Santa Fe.	Will treat until eradicated using the Transnet EMP Funding and CNLM funding.
Eucalyptus species (*Eucalyptus* spp.) M*	Riparian and upland areas throughout the HCA.	Moderate. At least 200 individuals across the HCA.	If budget permits and if deemed safe by preserve management, approximately 10 trees will be cut and killed annually.
Fennel (*Foeniculum vulgare*) H*	Located throughout the HCA.	Size is variable, but only considered moderate in several locations at the Greens.	Will treat on an annual basis.
Shamal Ash (*Fraxinus uhdei*) NA*	Box Canyon.	Low. Several individuals in Box Canyon.	Will treat using compensatory mitigation funding received from Morrow Development as part of USACOE regulatory permit sign-off obligation.

Threat	Locations	Size or Severity	Future CNLM Actions (Over Next Five Years)
Daisy (*Gazania* spp.) NA*	Franks Peak and other scattered locations.	Low infestation. Small patch, less than 1/8 acre.	Will eradicate within the next five years.
Perennial pepper weed (*Lepidium latifolium*) H*	The Greens.	Low because infestation is being controlled. Several acres.	Will continue to treat using the Transnet EMP Funding and CNLM funding.
Myoporum (*Myoporum laetum*) M*	Only several individuals located.	Very low.	Will eradicate within the next five years.
Tree Tobacco (*Nicotiana glauca*) M*	Located throughout the HCA.	Low. ~30-40 individuals.	Will treat on an annual basis.
Olive Trees (*Olea europaea*) L*	Located at the Greens.	Low, several large individuals.	Will eradicate within the next five years.
Fountain Grass (*Pennisetum setaceum*) M*	Located throughout the HCA, but largest occurrence is along Old Rancho Santa Fe Road and on Box Canyon cliffs.	Severe along Old Rancho Santa Fe Road (1 acre) and Box Canyon (1 acre), but very low in other areas.	Will treat on an annual basis.
Canary Island Date Palm (*Phoenix canariensis*) L*	The Greens.	Moderate. Approximately 10	Will kill small trees when located. Large trees will be left unless funding is obtained for a professional arborist.
Russian Thistle (*Salsola tragus*) L*	Located sporadically throughout the HCA, mostly in restoration sites (Huff and Old Rancho Santa Fe Road).	Moderate at the Huff restoration site and low everywhere else.	Will treat on an annual basis.
Castor Bean (*Ricinus communis*) L*	Riparian areas (primarily Huff).	Very low. Scattered sprouts and small individuals.	Will treat on an annual basis.
Peruvian Peppertree (*Schinus molle*) L*	The Greens.	Low. Several trees.	Will eradicate within the next five years.
Saltcedar (*Tamarix* sp) H	Riparian areas, primarily at the Greens.	Low. Sprouts and small individuals.	Will eradicate within the next five years.
Non-native Forbs: Black Mustard (*Brassica nigra*) M*; Sahara mustard (*Brassica tourneforttii*) L*; Tocalote (*Centaurea melitensis*) M*; Mustard (*Hirschfeldia incana*) L*; wild radish (*Raphanus sativus*) L*; Milk Thistle (*Silybum marianum*) L*, Italian thistle (*Carduus pycnocephalus*) M*, Bristly Ox-tongue (*Picris echioides*) L*, and other non-native forbs to a lesser degree	Located throughout the HCA in all habitat types.	Severe for some species in several locations, such as black mustard, tocalote, and bristly ox-tongue, but less severe for other species.	Species will be treated if deemed necessary (i.e., growing in occupied sensitive plant habitat and/or if species is especially pernicious, like *Brassica tourneforttii*).

Threat	Locations	Size or Severity	Future CNLM Actions (Over Next Five Years)
Mexican Fan Palm (*Washingtonia robusta*), M*	Riparian areas, primarily the Greens and Box Canyon.	Moderate. Approximately 8.	Will treat using compensatory mitigation funding received from Morrow Development as part of USACOE regulatory permit sign-off obligation. Will kill small trees at the Greens but will leave large trees unless a professional arborist can be hired to remove the trees.
Non-native Annual Grasses: Rip-gut Brome (*Bromus diandrus*) M*, Red Brome (*Bromus madritensis* ssp. *rubens*) H*, Soft-chess Brome (*Bromus hordeaceus*) L*, Wild Oats (*Avena fatua* and *A. barbata*) M*, Purple False-brome (*Brachypodium distachyon*) M*, and other non-native grasses to a lesser degree	Located throughout the HCA in all habitat types.	Severe for some species in several locations, such as purple false brome and wild oats, but less severe for other species.	Species will be treated if deemed necessary (i.e., growing in occupied sensitive plant habitat and/or if species is especially pernicious).
Alteration of Natural Disturbance and Cycles			
Altered Fire Frequency and Intensity	Altered Fire Frequency and Intensity	Altered Fire Frequency and Intensity	No action planned at this time.
Climate Change	Climate Change	Climate Change	No action planned at this time.
Direct Human Impacts			
Trespass	The Greens, the Brouwer Quarry area, and Box Canyon.	Low and moderate at Box Canyon.	Continue patrol of all problem areas. Involve law enforcement when necessary (i.e., issuance of tickets at Box Canyon).
Unwanted Off-trail Activity and Vandalism	Throughout the HCA.	Low.	Continue patrol of all problem areas. Fix vandalized signage and fences and restore, to the extent possible, illegal trails.
Off Leash Dogs	Denk Mountain.	Severe on Denk Mountain and low in other areas.	Continue patrol of Denk Mountain and engage in public outreach to inform users of problems with dogs off leash.
Itinerant Encampments	The Greens.	Low to moderate.	Continue to patrol the Greens and remove itinerant encampments when located.
Trash and Debris	Throughout, but primarily at Franks Peak, Elfin Forest Off-site and Choumass-Pappas.	Minimal throughout.	Continue to patrol and remove trash when located.
Erosion	In specific locations, such as along Denning Road.	Low.	Fix erosion if budget permits.

*L=Low threat; M=Medium threat; H=High threat; NA=Not applicable.

of threat (i.e., stressors, risk factors). Here, we use the definition of risk factor (or threat) as an activity or process that threatens the viability of a population and can cause negative trends in population size (Regan et al., 2006). Over the years, HCA threats have been closely monitored and noted and management actions have been set out to minimize these threats as listed in Table 10.

Generally speaking there are two primary threats to the sensitive annual plants and vegetation communities, 1) the presence of non-native annual grasses and forbs and, 2) an altered fire regime. Either threat can lead to habitat degradation, and thus plant or animal species declines.

Although fire frequency and causes of pre-human induced fire, are still being debated in the literature, it is clear that fire plays an important role in ecosystems. The fire regime can have significant effects on biota either as a result of the lack of fire over an extended period of time, or from fires that occur (such as too frequently) in which the biological communities or individual species have not adapted (as summarized in Tierra Data, 2005). Habitat managers have to be concerned about the effects of fires that occur too frequently, or too infrequently. For example, if the fire frequency and intensity are too great, plants in the DCSS community, such as black sage and California sagebush can be permanently killed and can no longer regenerate, converting the DCSS community to an exotic, annual grassland (Southwest Division, Naval Facilities Engineering Command, 1998). Conversely, the absence of fire may impact species that are mostly dependent on fire for recruitment, such as DMM and wart-stemmed ceanothus.

Other threats include, the potential loss of animal and plant genetic diversity due to loss of landscape connectivity (connection blocked by adjacent roads and housing communities), edge effects (i.e., erosion, vegetation clearing) from adjacent housing developments, noise and light from roads and housing interfering with mating activities, vandalism, plant trampling, and plant and animal poaching. Some of these potential threats are exacerbated due to the fact that the HCA is open to the public. Climate change is also a threat, which could tilt competition in favor of certain non-native species, accelerate certain indirect threats like fire frequency, and decrease seedling survival (because of increased moisture stress) leading to decreased survival of native species. While it is not possible for CNLM to stop or prevent climate change or the initial constraints imposed by development, it is possible to reduce, or mitigate many of the indirect effects through adaptive management.

The following sections list and discuss ecological threats for the HCA's primary vegetation communities and sensitive plant and animal species.

A.1. Diegan Coastal Sage Scrub and Southern Maritime Chaparral Ecological Threats Model

Diegan coastal sage scrub and SMC are sensitive plant communities and comprise a large percentage of the overall vegetation community acreage. The dominant plant species of DCSS is California sagebush or black sage (i.e., Denk Mountain and the Huff parcels) and the associated species include California buckwheat (*Eriogonum fasciculatum*), laurel sumac (*Malosma laurina*), and coyote bush. The dominant plant species of SMC is chamise (*Adenostoma fasciculata*). Associated species include DMM, wart-stemmed ceanothus, summer holly and Nuttall's scrub oak.

DCSS and SMC vegetation communities are adapted to a particular fire regime with fires occurring naturally, but most severely under the extreme Santa Ana heat and winds of late summer and fall. During these conditions there would generally be a "complete burn" where all above-ground vegetation within the fire's path would be consumed. After such a fire, herbaceous plants, which are known to sprout after fires (fire followers), would dominate the landscape for a few years. Over time (3-5 years) the shrub lands would regain their dominance, and after 7-10 years a mostly mature assemblage of plants and wildlife would again be found on site. However, post-fire vegetation recovery also depends greatly on many variables including fire intensity and frequency, season, community age and diversity, slope, soil type, and weather—and the availability of a soil seed bank or other source material for natural regeneration.

Based on principle, it is not definitive whether or not it is imperative to provide management proxies for the natural fire regime historically experienced in sage scrub and chaparral communities in southern California prior to human habitation. Complicating this decision is the difference in historical fire regimes in DCSS and SMC communities related to species composition and diversity, proximity to the coast, etc. At least one expert does believe that there is a true risk of community type conversion due to frequent fires in addition to the possibility of community "senescence" in the long term absence of fire (Keeley, 2007). The lack of fire in a sage scrub community can result in canopy cover and species diversity reductions. A lower level of native annuals is present and in some cases, based on the length of time between fires, can disappear all together. Sedentary (e.g., non-migrating) animal species that depend on these annual species are at risk of disappearing from the community. Nitrogen-fixing organisms are also greatly reduced with prolonged absence of fire (Tierra Data, 2005). Results from studies suggest that DCSS is more resilient to short fire return intervals. However, it has also been noted that this community appears to be at greater risk of type conversion to non-native, annual grasslands. This may be a result of too great a fire return interval (5-10 years) or the increase in the fire frequency from the heavy annual grassland invasion. The apparent type conversion noted in the DCSS community may also be exacerbated by drought coupled with the slow temperature increase over the past ten thousand years. Additionally, post-fire resprouting in DCSS tends to be more successful in younger shrubs and at coastal sites (Tierra Data, 2005). Portions of the HCA are considered coastal and portions are inland. After 25-35 years, dominant sage scrub species begin to die in areas that have not burned for 60 years or more (Tierra Data, 2005). The majority of the DCSS burned in 1996. It can be assumed that at this point, prevention of fire in these areas will be paramount to the overall health and longevity of the DCSS and animal species that depend on this community for survival (i.e., CAGN). The eastern portions of the HCA (Denk Mountain and Huff parcels) are dominated by black sage. These areas burned in the 1996 Harmony Grove Fire as well. Over the past five years, CNLM management has noticed a high level of mature black sage die off and an obvious lack of seedling recruitment. CNLM attributed this die off to the drought conditions that were experienced in the early to mid 2000's. If this area burns too soon, it is highly likely that it will be type converted to a non-native grassland plant community due to the lack of mature black sage individuals and replenishment of the soil seed bank by these mature shrubs. CNLM is concerned about this die off and will need to monitor these areas, in addition to other DCSS-dominated areas, to determine community baseline conditions in case fire returns too quickly. It is unknown when the Greens portion of the HCA last burned, but Preserve Management has noted that the DCSS appears healthy, with obvious recruitment occurring and a high percentage of native, annual species co-occurring with the perennial DCSS plants.

There is some evidence that chaparral communities in particular can persist for a century or more without being burned and will recover just as well as younger stands after a fire event (Keeley, 2007). However, with absence of fire in a chaparral community, a shift may occur that favors the vigorous crown sprouters, like oak and toyon (*Heteromeles arbutifolia*). These species grow taller; increasing in canopy cover, thereby outcompeting the obligate seeder species like ceanothus (*Ceanothus* ssp.) (Tierra Data, 2005). Additionally, older chaparral stands that have gone for many years without fire lack the native, annual understory, much like a sage scrub community. And, like the sage scrub community, sedentary animal species that depend on these annual species are at risk of disappearing from the community. Once again, it is unknown when the Greens portion of the HCA last burned. This area supports the SMC community and the sensitive and listed shrubs that occur in the SMC. One document in particular mentions the preclusion of fire at the Greens as a concern for continued persistence of DMM (USFWS 1993)

Currently the species that compose the SMC community at the Greens do not appear decadent and an overabundance of mortality has not been noted. The community, in general appears healthy; however, it is unknown how long the community will be free from the risk of senescence considering prescribed fire is not possible and naturally occurring fires, that consume all of the SMC, are highly unlikely due to close proximity to residential developments. DMM and wart-stemmed ceanothus, which rely on fire for seedling recruitment are also potentially at risk of disappearing with the lack of fire. At this time, it appears that the main threat for both the DCSS and SMC communities is an altered fire regime, with fires either occurring at intervals that are potentially too long for healthy community development or fires occurring too frequently, resulting in type conversion. It is necessary to study the SMC community, like the DCSS community to establish baseline conditions and to research the effects of fire if absent for too long (i.e., the Greens).

Another issue of concern is the encroachment of non-native plants due to the urban nature of the HCA and the existing level of non-native plant species. Encroachment of non-native species from adjacent housing developments is apparent in some areas and should be monitored and controlled.

As previously discussed, there are other threats than just an altered fire regime and non-native plant species, but these two threats are the focus of our management and monitoring. In sum, management objectives will focus on assessing the DCSS and SMC communities' attributes, researching the historical fire regime and the potentially negative effects of an altered fire regime in these communities, and beginning conversations with the local fire department and regulatory agencies regarding altered fire regimes and potential solutions.

A.2. Coastal California Gnatcatcher Ecological Threats Model

The CAGN was listed as threatened by the USFWS in 1993 and is currently listed as a Species of Special Concern by CDFG. At the time of listing, the number of pairs was estimated to be about 1,600 to 2,500 (Atwood, 1990; Atwood, 1992; MBA, 1995; USFWS, 1993). This listing was a result of concerns in a decrease in the numbers of this species due to loss and fragmentation of their habitat, coastal sage scrub.

In San Diego County, CAGN occur most commonly in coastal sage scrub dominated by California sagebush and California buckwheat. Some protected areas, such as the HCA in Carlsbad, are dominated by black sage and laurel sumac. These latter areas also support CAGN, but in lower densities, which has been observed in other black sage-dominated areas (AMEC et. al., 2003).

CAGN are resident species that usually breed between February and July. Typical nests support 3-4 eggs and are usually 3-4 feet from the ground in shrub species, such as California sagebush and buckwheat. Atwood (1999) studied nest success and found average number of fledglings per pair between 2.3 and 3.0 per season (Standard Deviation 2.1-2.55) in Orange County. Nest failure is usually a result of predation by ground predators, such as raccoons (*Procyon lotor*) and other birds, primarily the scrub jay (*Aphelocoma californica*). Due to the highly urbanized nature of the HCA, predation resulting from domestic animals, such as house cats, could lead to higher predation rates than larger, more intact areas; however, coyotes, are very abundant, and cats are rarely observed as they are likely quickly preyed upon by coyotes. Brown-headed cowbird nest parasitism has also been known to cause nest failure (USFWS, 1991).

Although there has been no collective/concurrent surveys for this species throughout its historic range, subregional and habitat conservation plan level surveys have been conducted (USFWS, 2009a; CNLM/City of Carlsbad, 2010). In 2003, the USFWS began a San Diego region-wide survey effort (covering approximately 40,000 hectares) using point counts. USFWS estimated 1,667 pairs in their sampling frame (Confidence Interval=1,240-2,176;) for 2009 surveys, which was a similar result to their 2003 and 2007 surveys. In 2010, the City of Carlsbad, in conjunction with Preserve Managers in its jurisdiction, collectively and concurrently surveyed about 75% of all suitable CAGN habitat in Carlsbad using focused surveys. Eighty-five pair and 42 male CAGN were reported in 2010 in the City of Carlsbad. CAGN were observed across the City in small, medium and large habitat fragments (range 1-900 acres) and suitable vegetation patch sizes (range 1 to 315 acres). Average density of CAGN in Carlsbad is between 8-12 acres per pair (CNLM/City of Carlsbad, 2010). Current density in Carlsbad is consistent with what was estimated during the MHCP planning process for coastal areas, as are the estimates of minimum (occupied) patch size (AMEC, et. al., 2003).

Although habitat loss continues to threaten CAGN, habitat conservation planning throughout San Diego County has assured many thousands of acres will be protected and the likelihood of this species' persistence is high. Although lack of habitat connectivity is a problem in many areas of San Diego, studies have shown that individuals have dispersed up to five miles and individuals are capable of traversing man-modified landscapes (Mock and Bolger 1992).

Primary threats to the species, in general, include habitat degradation by off-trail use, dogs' off-leash, and non-native plant species, and possible habitat loss due to altered fire regime and subsequent habitat type conversion.

Deterioration of habitat structure will result in less acreage of suitable nesting habitat and a likely decrease in productivity and persistence.

In sum, management objectives will be implemented that will combine the knowledge of the biology of CAGN, monitoring of the species and its habitat needs, and the challenges posed by the threats to the species.

A. 3. San Diego Thornmint Ecological Threats Model

SDTM is a small, winter annual from the Lamiaceae family that occupies clay lens openings in coastal sage scrub and chaparral. Its association with clay lenses, generally poor-quality habitat for many plants, is presumably a reflection of competition with both native and non-native annual plants. CNLM prepared a plant abstract for SDTM (Appendix F) that provides a useful summary of SDTM information that is most pertinent to management. The abstract provides a variety of information, from the most basic and factual (distribution, taxonomy, etc.) to the more subjective (e.g., management concerns and actions).

SDTM is known from 80 historical and 55 extant occurrences in coastal San Diego County, California, and 13 (within unknown status) occurrences in Baja California Norte, Mexico (Sierra Juarez and coastal) (USFWS, 2009b). The known extant occurrences in San Diego County range from the City of Oceanside in the north, to Ramona in the east, to Jamul in the southeast. Approximately 70 percent of extant occurrences are currently protected from development (USFWS, 2009b).

A study of potential SDTM pollinators conducted in 2008 and 2009 at several San Diego County SDTM occurrences indicated that of the insects that visited SDTM flowers, those that were less than six millimeters were able to enter SDTM flowers. Larger insects that were not able to enter SDTM flowers are not, therefore, potential pollinators of SDTM. Identification of the insect species that could enter the flowers indicated that insect generalists, rather than specialists, are most likely responsible for pollination of SDTM. It was also suggested that competition from native and non-native plants and subsequent ground thatch may prevent insect visitors from visiting flowers and also prevent ground nesting bees (considered primary SDTM pollinators) from nesting in occupied SDTM habitat (Klein, 2009).

Approximately 380 SDTM individuals were located in the HCA in 2010 in one occurrence (California Natural Diversity Database [CNDDB] Element Occurrence [EO] 82). This occurrence is relatively small in nature when compared to some other North County SDTM occurrences. The occurrence that supports the highest number of SDTM plants in North County is CNDDB EO 70, located north of Palomar Airport Road and east of El Camino Real in Carlsbad. This occurrence is owned by San Diego County. The CNLM SDTM occurrence appears healthy and stable and will likely remain so if non-native plants are controlled.

Many threats to SDTM are documented in the SDTM plant abstract (Appendix F). One of the primary threats to SDTM is the competition with non-native, annual grasses and forbs. This threat is a primary focus for the next five years of management. Competition with non-native plant species is also considered the primary threat to SDTM in the Five Year Review for SDTM (USFWS, 2009b). Non-native species such as crete hedypnois, tocalote, prickly sow-thistle, plantain (*Plantago virginica*), and black mustard are considered the primary threats to SDTM. These species have the ability to outcompete SDTM. Management of these non-native species is imperative to the long-term survival of SDTM.

Another threat to SDTM is lack of information concerning population genetic structure and local adaptation. The large number of small occurrences, and the degree of extirpation, create a need for enhancement or restoration. However, there is no information to guide the selection of genetically appropriate sources for restoration purposes. The importance of proper selection of seed source is underscored by the high failure rate of translocated occurrences (USFWS, 2009b). Towards providing information on genetic structure and local adaptation, CNLM has prepared a plan for a genetic study to commence in 2012. Within the next five years, CNLM will collect SDTM plant parts and seeds from the HCA and throughout San Diego County, to use in a range-wide isozyme study and a common garden study to investigate local adaptation in several occurrences. Determining the genetic variation among and within

populations may assist with, and provide justification for, future restoration and/or translocation projects. Other attribute information, such as site health and plant species composition within occupied SDTM occurrences, will also be collected as part of the genetic study.

Other threats to SDTM include soil compaction, erosion, water runoff, dumping, and occurrence vandalism. Management will aim to reduce or mitigate these threats so as to improve the persistence and recovery of the species.

A. 4. Del Mar Manzanita Ecological Threats Model

DMM is a burl-forming perennial shrub species from the Ericaceae family that grows in chaparral on sandstone terraces and bluffs and coarse sandy or rocky silt loams. It is capable of reproducing via seed and burl (lignotubers). The seed is stimulated to germinate by the chemicals that remain in the soil after a fire burns through the occupied habitat. The lignotubers also sprout after disturbance, such as fire. In the absence of fire, seed cannot germinate and lignotuber sprouting is infrequent but does occur (USFWS, 2010). Several of the DMM shrubs in the HCA do not have burls. This has been noted before by previous researchers (Jon E. Keeley, personal communication, October 18, 2010). In coastal sites where fire is infrequent DMM shrubs can spread by layering. The stems that arise from the layering often fail to produce burls (Jon E. Keeley, personal communication, October 18, 2010). DMM is shade intolerant and can be outcompeted by taller, canopy forming chaparral species. The seed produced by DMM shrubs has low viability and there is a large variation in the annual seed production (USFWS, 2010). At times there can be a very large seed set and at other times, no seed will be produced at all. It has been noted in the HCA that over the past five years, little to no seed have been produced by many of the DMM shrubs. The seed, when produced falls to the ground close to the parent plant and are consumed by small rodents and may be transported by larger mammals some distance from the original parent plant. The soil seed population is also very low (USFWS, 2010). The flowers are self incompatible and generalist insect species visit the flowers (USFWS, 2010).

DMM ranges from Carlsbad in the north to Torrey Pines in the south and east to Marine Corps Air Station (MCAS) Miramar, Mission Trails Regional Park, and the Lake Hodges and San Marcos areas. It was also known from Baja California at the time of listing, but the status of these occurrences is unknown at this time (USFWS, 2010). Of the 50 occurrences considered extant in southern California 32 occurrences can be located within 6 miles of the coast and the remaining 18 occurrences are located between 6 and 13 miles from the coast (USFWS, 2010). Based on recent literature the majority of the individuals once considered DMM in the Carlsbad region, are now considered a more common species (Keeley et al., 2007).

Surveys conducted in 2008, located 9 DMM. Originally, 800 plants were estimated to occur on the Greens. However, based on the Keeley dichotomous key (Keeley et. al., 2007), DMM is now even more restricted than the original geographic extent. The majority of the DMM individuals were located, the morphology of each individual confirmed, and then mapped. Over 80 *Arctostaphylos* plants were sampled and keyed during the surveys. It is likely that more DMM do exist on the Greens, as it was impossible to locate, hike to, and identify every single *Arctostaphylos* individual. No seedlings were located during the surveys. The DMM occurrence at the HCA is known as CNDDB EO 14. This occurrence was originally considered large in context to other occurrences in northern coastal San Diego County. However, now, based on the Keeley key, this occurrence is considered extremely small and the majority of the *Arctostaphlyos* plants are clearly Eastwood's manzanita. The majority of the DMM plants are protected from human impacts and relatively far from the HCA edge.

The primary threat to DMM is assumed to be similar to the primary threat to the SMC vegetation community—an altered fire regime. DMM seed does not germinate without stimulation from chemicals that remain in the soil after a fire. And even though it is possible for the shrub to spread, via layering, fire obviously plays a very important role in species recruitment. It is unknown when fire burned through the DMM occurrence and no seedlings have been located. There is no published literature suggesting a fire return interval that would be either beneficial or harmful to DMM recruitment; however, it was noted that the 2003 Cedar Fire appeared to have a positive impact on the DMM growing on MCAS Miramar (USFWS, 2010). Additional threats to DMM include shading (DMM is shade intolerant), non-native plant species, human impacts (trampling, complete plant removal), and climate change.

Management objectives will be implemented that will primarily focus on assessing habitat conditions where DMM shrubs are growing and researching the historical fire regime and the potentially negative effects of an altered fire regime on this species, and beginning conversations with the local fire department and regulatory agencies regarding altered fire regimes and potential solutions.

A. 5. Thread-leaf Brodiaea Ecological Threats Model

TLB is a perennial herb member of the Themidaceae family that produces leaves, scapes and flowers from an underground storage structure called a corm. Leaves begin to emerge in early to late fall and are fully obvious by late January to mid-February. The scapes begin to emerge in late February/early March and flowering can occur from March through June. This species can be found growing in mesic, non-native grassland, non-native forbland, native grassland, and alkaline grassland communities, but only is found growing in non-native grassland habitats on the HCA. The surface horizon textures where this species occurs, at least in one study, include clay loam, clay, sandy clay, sandy clay loam and loam (AMEC, 2009). Soil texture appears to play a dominant role in TLB distribution on Marine Corps Base Camp Pendleton (MCBCP) with TLB affinity for finer, clayey soil textures that could be related to moisture availability and soil temperature (AMEC, 2009). TLB on MCBCP also appears to prefer specific soil types that contain cracks formed by shrink processes (AMEC, 2009). Large soil cracks are apparent in all of the TLB populations within the HCA.

The species' primary mode of reproduction is vegetative, via cormlet production, but the species also produces seed. TLB is self incompatible, which means that it cannot produce seed from pollen on the same plant and that separate plants with different alleles, or a different form of a gene at the self-incompatibility gene locus/loci, need to be present nearby in order for seed production to occur (USFWS, 2009c). Native insects, primarily beetles (Mordellidae, Colioptera) and bees (Halictidae, Hymenoptera) are primarily responsible for cross-pollination of *Brodiaea* species; however, other insect species have been observed visiting TLB (USFWS, 2009c).

Sixty-eight disjunct occurrences are known from Los Angles, Riverside, San Bernardino, Orange, and San Diego Counties. In San Diego County, there are 40 known occurrences with the largest concentration occurring on MCB CP (USFWS, 2009c). Within the HCA, there are two occurrences (California Natural Diversity Database Element Occurrences 33 and 34) containing six disjunct populations. Each population is separated by houses and roads, but the distance between each population is not greater than 0.10-mile. Approximately 7,000 individuals were originally recorded as occurring based on early biotechnical documents prepared for the original Fieldstone Project (Fieldstone, 1995). However, approximately 8,291 flowering individuals were located during surveys in 2008 and another 14 plants were located in 2009, for a total flowering count of 8,305. The more accurate population estimation though, should be based on vegetative individual counts. Research at the HCA has revealed that approximately 0 to 26 percent of a vegetative population actually flowers (CNLM, 2010b). The highest vegetative count from 2008 revealed that approximately 29,589 vegetative individuals were growing in three 160 square meter study plots (CNLM, 2010b). That same year, only 4,238 TLB individuals flowered in these same three study plots (14.3 percent of vegetative population actually flowered) (CNLM, 2010b).

The primary threat to TLB in the Five-Year Review (USFWS, 2009c) for the species was habitat loss due to urbanization and agricultural conversion. Urbanization and agriculture conversion are not threats to TLB in the HCA. CNLM believes that there are three primary threats to TLB in the HCA: alteration of hydrologic conditions leading to permanent soil saturation (and corm die-off) in occupied TLB habitat, population decline or loss due to a reduction in genetic migration amongst and in between populations, and non-native plant species. The Five-Year Review (USFWS, 2009c) also indicates alteration of hydrologic conditions and non-native plant invasion as TLB threats. Loss of genetic migration is not identified as a threat in the Five-Year Review (USFWS, 2009c). Upslope water runoff, from the La Costa Greens development, has resulted in loss of some TLB individuals (that were not part of the HCA, but adjacent to the HCA). Additionally, there is one TLB population that receives upslope runoff on a regular basis. CNLM has had several discussions with the local HOA about this problem. CNLM has not noticed any die off of the TLB population in that particular location since water runoff has been reduced as a result of HOA discussions. Additionally, as mentioned before, all of the populations are separated by roads and homes and it is unknown if gene transfer between populations is occurring that would result in viable seed production. In

order for the occurrences to remain healthy, gene transfer into and out of populations will be necessary, if it is not presently occurring. Last, the presence of non-native species, specifically purple-false brome and non-native, annual forbs (*Picris echioides*, *Brassica nigra*) is considered a threat to TLB because these species comprise a large percentage of cover in some of the occupied TLB habitat, thereby forcing competition between TLB and these non-native species for available nutrients, sunlight and water. A CNLM research project revealed that scape number and scape length were increased significantly when non-native grasses were removed from occupied TLB habitat possibly indicating an increase in the availability of nutrients and water to TLB (CNLM, 2010b). Management objectives will be implemented that will focus on curbing upslope water runoff, reduction of non-native species and introduction of native species into occupied habitat, and TLB genetic studies, if possible.

Other threats to this species include dumping of landscape waste onto existing populations, accidental mowing of individuals for fuel reduction purposes, unauthorized habitat impacts from trespass (i.e., kids from nearby housing developments digging and building forts in occupied habitat), non-native plant species invasions, drought, and climate change.

A. 6. Orcutt's Hazardia Ecological Threats Model

OH is a perennial shrub member of the Asteraceae family. There are six known occurrences in the United States and 13 in Mexico. The only known naturally existing occurrence is at the Manchester HCA (western mesa). The other occurrences—at the Manchester HCA northeastern mesa, the Rancho La Costa HCA, Kelly Ranch HCA, the San Diego Botanical Gardens, and the San Elijo Ecological Reserve – are all the result of transplantation with materials from the Manchester HCA. Only two of 13 known occurrences were found in 2004 in Mexico (Vourlitis el al., 2006). At that time, the species did not have protected status (Gogal-Prokurat & Osborne 2002). However recently, Terra Peninsular, a Mexican based non-profit organization, submitted listing proposals for six threatened or endangered plant species in Baja California, including SDTM and OH. This proposal will be published as a draft revision to Norma Oficial Mexicana (NOM 059), a Mexican environmental law (Terra Peninsular, 2010).

There is some information available on the reproductive biology of the species. It flowers in early summer and sets seed in the late summer or early fall. Based on research, it appears that OH has a very low reproductive output, with the causes unknown (Vourlitis et al., 2006). The same study revealed that 95 percent of the flowers examined had been damaged by insects or fungal agents or had aborted prematurely. Additionally, insects or fungal agents damaged 50 percent of the seeds produced.

In 2004, 200 OH plants were transplanted onto the Greens. Approximately 160 plants were located in 2006 and 156 adult plants were located in 2010. Approximately 8 OH seedlings and 2 juvenile individuals were also located in 2010 growing within the transplant occurrence. This is the first year that these seedlings and juveniles had been located in this transplanted occurrence. All of the seedlings established in early 2010 and the juveniles likely established in 2009 and are approximately 2 years old.

Although reproduction and recruitment at the natural occurrence (Manchester HCA, western mesa occurrence) may be low in some years, there is considerable evidence of natural reproduction and recruitment at most of the OH transplant locations. The survey in 2010 at the Manchester HCA revealed 246 naturally recruiting individuals in the transplant occurrence located on the northeastern mesa. The first seedlings were located in 2006 and additional seedlings have been located in each subsequent year. The 246 individuals are a mixture of first year seedlings and individuals that are older than one year. Flowering has been observed for the past several years on the individuals at the Manchester HCA that are approximately four to five years old. Furthermore, seedlings and young adults have also been located in the transplant occurrence at the Kelly Ranch HCA in northern Carlsbad since 2008 and seedlings were also noted in the transplant occurrence at the San Diego Botanic Gardens in Encinitas. Seedlings have not been located at the transplant occurrence located at the San Elijo Ecological Reserve and OH mortality is high among transplanted individuals. It does appear based on the recruitment of seedlings at several of the transplant occurrences, that this species can produce viable seed and recruit when site conditions are favorable.

The primary threats to OH are assumed to be potential occurrence extirpation due to stochastic events, altering or loss of suitable habitat for the species, reductions in fitness due to low genetic variability, and disease. The occurrences are small in nature and small populations are inherently vulnerable to the aforementioned threats. Additionally, it is unknown how this species would react to fire. High litter accumulation from non-native, annual grasses (specifically purple false brome) may also be considered a deterrent to seedling establishment and thus a threat to the species (Vourlitis et al., 2009). Other threats to the species include human impacts (shrub damage or removal), potential loss of pollinators, and climate change (e.g., drying out of soils with temperature increases).

Management will focus on tracking adult and seedling survival, health, and recruitment. As with SDTM, the OH occurrence is small and extremely vulnerable to extirpation. Lack of genetic diversity may also be a problem, given that all plants in the translocated occurrences were grown using seed collected from the extant US occurrence. Long-term monitoring will be important to determine whether transplantation will contribute to species persistence. Information will also be collected on environmental conditions, such as soil type, that could reflect appropriate habitat for the species. The naturally existing occurrence is growing in soils with heavy clay content. However, one study found that OH seedling establishment was actually higher in soils that had a lower clay content indicating that OH is apparently not restricted to heavy clay soils (Vourlitis et al., 2009). Soil samples will be collected from the HCA OH transplant occurrence. Information about the soil at the transplant and natural occurrence (Manchester HCA western mesa occurrence) will be compared and may be useful towards determining appropriate locations for species reintroduction.

Additionally, seeking funding for OH genetic studies is imperative for this species. At this time, only three extant natural occurrences are known (1 in the US and 2 in Mexico). Because the US populations are small, they are inherently at risk of extirpation from inbreeding depression, disease, loss due to stochastic events, and climate change. Future translocations are absolutely necessary for the continued existence of this rare species. Determining the genetic variation among and within the US and Mexico populations may assist with appropriate selection of seed materials for restoration and indicate if there is a need for controlled breeding or genetic rescue of the remaining occurrences.

B. Adaptive Management

Management of dynamic systems requires a similarly dynamic management structure that is capable of appropriate response in the context of perpetual change. Natural areas that are managed for conservation objectives are subject to a suite of changing conditions from the biological (e.g., normal population dynamics, climate change) to the legal (e.g., resident species being down-listed, de-listed, or listed) to the social (e.g., increasing pressures for recreational use). Adaptive management was a concept developed in response to these challenges and was defined as the systematic acquisition and application of reliable information to improve management over time (Wilhere, 2002).

CNLM's interpretation of adaptive management embraces not only new scientific information but the possibility of new management objectives. As examples, new objectives could be the result of a change in the legal status of resident species, the need to consider a different restoration goal for the preserve because of changing climatic conditions, or a change in the preserve context whereby it either became connected with other preserves and acquired a ‘metapreserve’ context or became increasingly fragmented and isolated, undermining some original management objectives.

Our vision and application of adaptive management continue to grow with the maturity and experience of CNLM. At present, adaptive management is expressed and served by the following conditions:

(1) Analysis and interpretation of information gathered from site and interpreted at a spatial scale that is appropriate for the site and the species: Mandatory (i.e., regulatory agency) monitoring is supplemented with additional data collection and framed appropriately such that meaningful information is gained on resident species. As appropriate for the spatial scale of the species’ range, additional information from beyond the preserve may be used for interpretation. Similarly, the time scales of the species (i.e., lifespan, breeding cycles) help to determine how long information must be collected before it is biologically meaningful and can be interpreted for management purposes.

(2) Appropriate management structure: We require that management plans for each preserve be updated every five years. This provides an opportunity to consider the management trajectory and review relevant information.

(3) Staff selection: Preserve managers are selected who have a strong background in biological sciences, are comfortable in searching scientific literature and conducting scientifically rigorous field studies, and who have the ability to interact appropriately with the research community for management support.

(4) Sound record-keeping: Just as adaptation in the evolutionary sense depends on inheritance from one generation to another of the trait of interest, so too adaptive management relies on a strong institutional memory that transcends individual managers.

(5) Developing long-term relationships with researchers: The expertise needed to guide conservation-directed management is multi-disciplinary and best served by a team approach. Preserve managers accommodate requests from researchers to use the preserves for onsite research projects, barring any significant risks to native species and the environment. They also invest in relationships with the research community as an ongoing source of support for decision-making.

(5) Management stability: One of the preconditions identified for genuine adaptive management is sufficient (institutional) stability to measure long-term outcomes (Lee, 1993). CNLM's agreements for preserve responsibility-whether pertaining to ownership, management, or conservation easement compliance (or a combination)-are in effect in perpetuity. This provides the necessary stability and timeframe for effective adaptive management.

Section VI. is based on research and monitoring activities that occurred in the previous six years. The majority of the objectives and methods listed in the following section are a result of adaptive management decisions that were arrived upon based on observations, data gathering and data analysis during HCA surveys, projects, and other activities during 2005 – 2010. Additionally, the goals listed in Section VI. are similar in nature to the goals identified in the MHCP.

VI. Five-year Biological Management and Monitoring Goals

The following sections list the current goals, objectives, and methods for vegetation communities and sensitive species, including wildlife and plants. The timeline to accomplish the outlined objectives is provided below (Table 11). The goals are "statements of the intended long range results" of HCA management (Tierra Data, 2008) and the objectives are specific management work elements or projects that meet species and habitat-specific needs while taking into account known or perceived threats, a specified timeline and budget. Methods are listed under each objective and are intended to guide Preserve Management in accomplishment of objective implementation. Although the objectives are intended to be followed to the extent possible, there is leeway in choosing the methodology to reach each objective. Preserve manager discretion is essential given the need to respond adaptively to uncertain or fluctuating conditions such as fluctuating population sizes and species locations, weather patterns, detection of new listed plant or wildlife species, catastrophic or unpreventable phenomena (i.e., fire), economic/monetary constraints, personnel fluctuations, etc.

The following goals are generally consistent with the MHCP Management and Monitoring Plan (CBI et. al., 2003) and previous HMPs for the Rancho La Costa HCA (CNLM, 2005a & CNLM, 2001). Since HCA inception, CNLM has been collecting baseline data on plants, animals and vegetation communities. The results of these monitoring activities have resulted in generating the goals listed below.

The following is a list of general biological and conservation goals for the HCA:

- Conserve, monitor and manage the full range of native vegetation communities.
- Conserve, monitor and manage areas of habitat capable of supporting management focus species in perpetuity.
- Conserve, monitor, manage and enhance (if necessary) populations of management focus species.

Table 11: Summary of Management Objectives by Community and Timeline

Community or Species	Objective (Obj.)	2011*	2012*	2013*	2014*^	2015*
DCSS	Obj. 1 DCSS vegetation monitoring.					
	Obj. 2: Vegetation mapping.					
SMC	Obj. 1: Releve establishment and data collection.					
Clay Lens, Native, and Non-native Grasslands	Obj. 1: Vegetation mapping.					
	Obj. 2: Identify threats to each lens.					
CAGN	Obj. 1. Survey for and map distribution of CAGN.					
LBV	Obj. 1: Survey for and map distribution; nest surveys and threats identification.					
Wildlife Corridor Monitoring	Obj. 1: Track wildlife movement.					
SDTM	Obj. 1: Implement quantitative habitat assessment and track spatial distribution and abundance; direct counts.					
	Obj. 2: Obtain samples for genetic studies.					
DMM and other sensitive perennial SMC shrubs	Obj. 1: Determine long term effects of an altered fire regime for SMC sensitive plants.					
TLB	Obj. 1: Work with HOA's.					
	Obj. 2: Apply for grants to perform genetic studies (once over five year period).	TBD	TBD	TBD		
	Obj. 3: Continue weed management experiment and research methods to restore occupied habitat.			TBD	TBD	TBD
	Obj. 4: Install index monitoring plots and collect data.					
OH	Obj. 1: Count all individuals within the transplant occurrence and monitor the seedlings.					
	Obj. 2: Collect soil samples from the transplant occurrence (only once in 5-yr period).					
	Obj. 3: Dethatch and control non-native grasses.					
Southwestern Spiny Rush and San Diego Marsh-elder	Obj. 1: Finish Southwestern Spiny Rush and San Diego Marsh-elder mapping and population estimation (over the next five-year period).					

*Dark gray indicates year during which surveys or data collection will occur.

^Note: vegetation mapping of the entire HCA will occur in 2014.

A. Vegetation Communities

A.1. Diegan Coastal Sage Scrub and Southern Maritime Chaparral

The primary identified threats to DCSS and SMC appears to be the potential negative effects of an altered fire regime and non-native plant species. Habitat attribute data such as percent cover, species richness, and shrub mortality will be collected in the DCSS community. California Native Plant Society (CNPS) Combined Releve and Rapid Assessment Protocol (Appendix G) plots (CNPS plots) will be established in the SMC at the Greens and research into the effects of an altered fire regime on sensitive SMC plants will occur. This information will be useful in determining baseline conditions for each vegetation community and in identifying and evaluating the potential negative effects associated with an altered fire regime on DCSS and SMC. For example, DCSS with a high cover of non-native annual grasses may be more susceptible to type conversation with an increase in the fire return interval. Alternatively, data collected during CNPS plot establishment may also be used to support the need for prescribed fire or a project that mimics prescribed fire to avoid the potential loss of fire dependent species such as DMM.

Questions:

1. What is the percent cover, species richness, and percent shrub mortality within the DCSS community? What are the current vegetation and habitat attributes in the SMC community? How does this information assist in the determination of potential negative effects from an altered fire regime? Has the fire regime been altered for both communities? Is this a problem?

2. Is the extent (i.e. area) of each vegetation community changing over time?

Objective 1. Continue to collect attribute information for the DCSS community and collect baseline information for the SMC community.

> *Method* 1: CNLM initiated a study to track the changes in structure and composition of the DCSS community in 2009 (CNLM, 2009). Percent cover, species richness, and shrub mortality data, have been collected in established vegetation monitoring plots annually since 2009. Data in the DCSS vegetation monitoring plots will continue to be collected in order to build a baseline and trend of species cover and composition. These data will help to reveal if type conversion is occurring, or has occurred (i.e., after a fire) and if reduction or loss of any important DCSS plant species (i.e., black sage) is occurring. These baseline data can be used to determine specific planting palettes if DCSS revegetation is deemed necessary in the future.
>
> *Method* 2: Implement the CNPS plot method in SMC at the Greens. Establishing plots using this method will establish baseline conditions within the SMC. Review literature and research documents to determine the short and long term effects of an altered fire regime on the SMC community and the sensitive perennial species that comprise this community. This information combined with the CNPS plot method may be able to help in determining if the community is suffering from an altered fire regime.

Objective 2. Determine the spatial distribution and acreage of DCSS. Compare vegetation maps over time to determine if change is occurring and what is causing the change.

Vegetation communities were mapped for the Greens portion of the HCA in 2010 and all other areas were mapped as part of the original project developments (citations unavailable). All of the SMC in the HCA occurs on the Greens and therefore will not need to be remapped. In order to detect if any changes have occurred in the spatial extent of DCSS, a new vegetation map is required. This vegetation map will also aid in pre-and post comparisons should a fire burn the HCA.

Method: The DCSS community will be mapped using the Vegetation Classification Manual for Western San Diego County (Sproul, Keeler-Wolf, Gordon-Reedy, Dunn, Klein, & Harper, 2011). The minimum mapping unit should be ¼ acre; however a finer scale can be used. Historical aerials will be compared to newer aerials to look for any changes within these communities.

A.2. Clay Lens, Native, and Non-native Grasslands

Clay Lens and non-native grassland habitat management is vital to the continued persistence of sensitive plant species such as the SDTM, Palmer's grappling-hook, San Diego goldenstar, TLB, and chocolate lily. The primary threat is habitat degradation and possible extirpation from existing and any newly introduced non-native plants. It is important to map the existing spatial extent of these two communities to establish baseline acreage for tracking purposes and to identify any reduction or loss of sensitive species associated with non-native plant invasion, accidental habitat destruction, or type conversion (i.e., conversion from native forb dominance to non-native forb and/or native shrub dominance). Threats will be qualitatively measured and will be limited to those threats that are identifiable. Potential threats such as global climate change, which is not easily observed or measured, will not be identified or monitored at this time

Questions:

1. What is the acreage of each clay lens, native or non-native grassland patch?
2. What are the primary threats to each clay lens, native or non-native grassland patch?

Objective 1. Determine the spatial distribution and acreage of clay lens, native and non-native grassland habitat by mapping these vegetation types.

Method: Map the clay lens and non-native grassland (or native forbland) habitats using the Vegetation Classification Manual for Western San Diego County (Sproul, et.al, 2011). The minimum mapping unit will likely be smaller than ¼ acre. Use a hand-held Geographic Positing System (GPS) to obtain the acreage of each clay lens and non-native grassland patch, or hand-digitize using a GIS program if appropriate. Identify each clay lens, native, or non-native grassland patch with a unique identification number that can entered into a GIS program.

Objective 2. Identify and describe the threats to each clay lens and non-native grassland patch.

Method: Identify all sensitive plant species located in each clay lens, native, and non-native grassland patch. Directly count, or estimate the number of sensitive plant individuals in each patch. Identify all observable threats to each patch and take photographs of each mapped location. Some potential threats could include invasive plants, habitat loss due to erosion, trampling by the public, close proximity to a trail, native shrub encroachment, etc.

B. Sensitive Animals

The primary sensitive animal species which has been observed and monitored is the CAGN. Other sensitive species, such as the San Diego horned lizard and the southern California rufous-crowned sparrow also occur. Based on previous CNLM monitoring results (CNLM, 2011) southern California rufous-crowned sparrow occur in abundance throughout the HCA and therefore will not be studied further over the next five years. San Diego horned lizards also occur, but are not commonly observed. Data relating to horned lizard and other sensitive animal presence are summarized in previous CNLM reports (CNLM, 2002-2004; CNLM, 2005b; CNLM, 2006-2010a). At this time, sensitive animal surveys and research will focus on the CAGN and monitoring the habitat variables that are important to the continued persistence and survival of the other sensitive animal species (i.e., vegetation community monitoring described in Section A).

B.1. Coastal California Gnatcatcher

In the last 10 years, CAGN abundance per survey area (see Table 6) has not been stable, and has fluctuated between years and the total number of observed CAGN during complete preserve-wide surveys decreased between 2007 and 2010 (see Section III.D, for discussion). Portions of the HCA support very high quality DCSS for this species (i.e., The Greens). Other portions of the HCA do not support high quality DCSS (Denk Mountain and Huff), but CAGN still occur in these areas. In sum, no trend for CAGN population numbers has been established at this time, which warrants subsequent monitoring efforts. All other sensitive animal species will be noted during CAGN monitoring activities. CNLM, the City of Carlsbad, USFWS and the San Diego Management and Monitoring Group have discussed studying CAGN movement in the Carlsbad and North County areas. These talks have stalled, and would only be possible with outside funding. However, movement studies could be important to understand population fluctuations at the HCA.

Objective 1. Determine the abundance, status and distribution of CAGN.

> *Method:* Focused surveys for CAGN will occur every three years. Surveys will include traversing all potentially suitable habitat (no more than 120 acres per day) to look for and map CAGN. A minimum of two visits in the spring months (March and April), separated by no more than 14 days, will be conducted. Observations will be hand mapped and later transferred to a GIS program. Status (single male, pair, etc) of each observation will be noted. All other sensitive animal species, or notable species, will also be noted and mapped.

B.2. Least Bell's Vireo

LBV have been observed in several locations throughout the HCA, but presence/absence surveys have not been conducted in many years. The number of LBV territories is unknown at this time and threats haven't been fully identified, although brown-headed cowbirds have been observed.

Questions:

1. How many LBV territories occur?
2. What are the current threats to the LBV?

Objective 1. Determine the number of LBV territories and identify threats.

> *Method*: Conduct three presence/absence surveys to determine the number of LBV territories. Surveys will include traversing all potentially suitable habitat to look for and map LBV. Two surveys in April and one in May should be sufficient to determine the number of LBV territories. Surveys will occur once during the five-year period. During all survey efforts, threats to the LBV should be noted and quantified to the extent possible (i.e., number of brown-headed cowbirds).

C. Wildlife Corridors

Large mammals have been tracked at several wildlife corridor locations over the past five years. Information regarding animal species, number of individuals and movement into and out of the HCA has been gathered using digital remote-sensing cameras. From this information, CNLM has been able to determine which species are present within the HCA and whether or not wildlife corridors continue to function as connections between CNLM-preserve lands and other MHCP and private open space lands adjacent to the HCA. Continuation of wildlife corridor monitoring is important for determining if long-term trends on wildlife movement can be made.

Questions:

1. Are the same mammalian predators that were observed during past monitoring efforts still using the wildlife corridors?
2. Has the frequency and temporal variation of mammalian predator use changed at these corridors?
3. Can any long term trends be made regarding mammalian use at the corridors?
4. What are the characteristics of each wildlife movement area and how might that affect movement?

Objective 1: Monitor movement through existing wildlife corridors.

> *Method*: Continue to use digital remote-sensing cameras at DKN 1, HC 1, and EF 1 (see Section IV.D. for location descriptions). Run each camera for four, 2-month periods, with each period being during a different season of the year. Each camera will record the date and the time of each photograph. The cameras should be set to take a photograph every 30 seconds so as to capture as much wildlife movement in an area as possible. Wildlife tracking at each of the three corridor locations should occur at least three times over the next five year period.

D. Sensitive Plants

The primary focus of sensitive plant management and monitoring is directed at the listed threatened and endangered species and performing research for those species that could be negatively affected by non-native plant species, an altered fire regime, altered hydrologic conditions, and limited genetic migration. Distribution of the majority of other sensitive species has occurred and threats to these species are considered low at this time; however, distribution mapping will occur for a few plants for which distribution mapping has not yet been conducted or completed and threats will be identified.

D.1. San Diego Thornmint

As stated earlier, SDTM, not only at this HCA, but in San Diego in general, is considered a highly threatened species. The primary threat for protected occurrences is non-native plant species competition and a secondary threat may be a lack of genetic variation among and within SDTM populations. Determining the genetic variation among and within populations may assist with, and provide justification for, future restoration and/or translocation projects. Monitoring over the next five years will focus on these two threats.

Objective 1. Assess the SDTM occupied habitat and monitor SDTM spatial distribution and abundance over time.

> *Method* 1: Continue to use the SDTM Habitat Assessment (Appendix E) in the SDTM occurrence. Determine if this method can also be used to track spatial distribution and abundance of SDTM over time. If it cannot, draft a quantitative methodology to track spatial distribution and abundance.
>
> *Method* 2: Directly count all individuals in each occurrence annually and use a hand held GPS unit to create polygon boundaries of each SDTM occurrence.

Objective 2. Conduct SDTM genetic and common garden studies.

> *Method:* In 2012, SDTM plant parts and seeds will be collected from the HCA and throughout San Diego County, to use in a range-wide genetic and common garden study. Other attribute information, such as site health and plant species composition within occupied SDTM occurrences, will also be collected as part of the genetic study. The methodology for the genetic and common garden studies will be determined by the CNLM Science Director. The required permits and permissions will be obtained prior to any SDTM collections.

D.2. Thread-leaf Brodiaea

The primary threats to TLB are altered hydrologic conditions, loss due to a reduction in genetic migration amongst and in between populations, and non-native plant species. CNLM needs to continue to maintain positive relationships with the local HOA to prevent further habitat impacts from upslope water runoff in order to ensure perpetual survival of the TLB occurrences at the Greens. Additionally, seeking out grant opportunities and enlisting support from academics to conduct genetic studies in and amongst the TLB occurrences will be very important for the long term health of TLB. CNLM began a TLB weed management research project in 2007. Continuation of this project should occur to further quantify the effects of non-native grasses and forbs on TLB. Using this information, native habitat restoration in occupied TLB habitat may begin in the future. Last, CNLM also will monitor TLB population fluctuation and spatial distribution throughout all occupied TLB habitat at the Greens. This is a difficult task since there are many thousands of individuals at the Greens and because this species grows in a clumped and patchy distribution. However, CNLM believes that is important to establish a monitoring program specific to TLB at the Greens to detect any threats or negative trends in areas occupied by this species.

Objective 1: Continue to work with the local HOA to avoid hydrological altering conditions in occupied TLB habitat.

> *Method*: Contact the HOA twice per year and more often if necessary in order to keep them apprised of the TLB sensitivity below their housing developments and landscaped slopes. Work together to determine appropriate solutions if impacts are observed.

Objective 2: Obtain funding to conduct TLB genetic and common garden studies.

> *Method*: Draft and submit grants to appropriate organizations to raise funds for a range-wide genetic and common garden study.

Objective 3: Quantify effects of non-native plants (specifically non-native grasses) on TLB and restore infested habitat with native species.

> *Method*: Continue the TLB weed management research project that was implemented in 2007 to further quantify the effects from non-native grasses and forbs on TLB. Based on this information, begin to research methods of restoring the TLB habitat to a native grass and forbland.

Objective 4: Monitor all occupied TLB habitat at the Greens.

> *Method*: Install index monitoring plots in all TLB occupied habitat patches. These index plots shall be located in potential problem areas (i.e., TLB patches that are receiving upslope supplemental irrigation from HOA landscaping) and areas that will likely remain unimpacted by current anthropogenic activities (i.e., the Greens northwestern TLB patch). Within each monitoring index plot, collect attribute information such as vegetative and flowering TLB counts, percent plant and edaphic cover, TLB spatial distribution, and any observable or identifiable threats. Photographs of each monitoring plot index will also be taken.

D.3. Orcutt's Hazardia

OH is considered a highly threatened species. The primary threat for protected occurrences is seedling establishment and recruitment and loss of the population or individuals through intentional or unintentional means. Our objectives are to continue to monitor the adult transplants and seedlings in the transplant occurrence. Additionally, CNLM plans on collecting soil samples from the OH transplant occurrence to compare it with the soil samples collected from the Manchester HCA extant OH occurrence (Vourlitis et. al., 2009). This research determined that the naturally extant occurrence grows in clay soils with specific water holding capacity and chemical composition. It is important to determine the soil composition within the transplant occurrence because seedling recruitment has been extremely slow, but is occurring. This information could be helpful in determining why seedling establishment has been so low and could be useful for future transplantation efforts. CNLM is also in the process of developing an OH "Plant Abstract" (similar to the SDTM Plant Abstract in Appendix F) which would

identify key management and monitoring issues and concerns, and any knowledge gaps. A secondary focus in the next five years is to attempt to attain funding to address some of the items listed in the abstract. Lastly, CNLM will control the non-native grasses growing around the parent plants with seedlings below to see if this will help to increase seedling establishment.

Objective 1. Monitor the OH occurrence.

> *Method*: Continue to count all individuals (adults and seedlings) in the transplant occurrence. Mark each seedling with a pin flag and use a hand held GPS to mark the location of each seedling.

Objective 2. Collect and analyze soil samples from the OH occurrence.

> *Method:* Collect soil samples and have them analyzed to determine if differences exist between the naturally, extant and transplant occurrences.

Objective 3. Enhance the existing OH population.

> *Method*: Dethatch and use a grass-specific herbicide to control the non-native grasses that are growing around the base of each parent plant to determine if this aids in increasing seedling establishment.

D.4. Southwestern spiny rush and San Diego Marsh-elder

Mapping and population estimation for southwestern spiny rush and San Diego marsh-elder commenced in 2008, but was not finished. Finalization of mapping for these species should be accomplished to determine species distribution and abundance.

Objective 1: Complete the mapping and population estimates for Southwestern spiny rush and San Diego marsh-elder.

> *Method*: Directly count, if possible all southwestern spiny rush and map patches of San Diego marsh-elder, since counting individuals is difficult and will likely result in an inaccurate population number.

VII. Habitat Maintenance Goals and Objectives

Habitat maintenance primarily includes tasks such as non-native animal and plant removal, erosion control, and fuel and fire management. In the last 10 years, most zero tolerance species have been treated, or comprise very low cover; except for the non-native grass species and some of these zero tolerance species still pose a major threat to the ecological process of the HCA. Control and even complete eradication of these zero tolerance species is imperative for the long term survival of vegetation communities and the plant and animal species that depend on these communities. Moderate tolerant species have also been dealt with, and vary in cover, and therefore, threat. Erosion is an issue along Denning Road and Xana Way. Large gullies have formed on either side of Denning Road and if these gullies continue to expand, the road will be impassable. Along Xana Way, there is an old brow ditch at the top of a dirt slope that isn't functioning properly. Each time it rains, soil flows down the slope and is deposited onto the Xana Way sidewalk. It is necessary to shore up this slope, using slope stabilization techniques or erosion control devices (or both). Fuel zones exist at four locations and the native and non-native vegetation in these fuel zones is managed on an annual basis to protect human life and property.

The goals and objectives for habitat maintenance are discussed below and outlined (Table 12). For purposes of this HMP, fuel management is defined as the maintenance of native and non-native plant material in pre-determined locations in order to protect human lives and private property from fire. Fire management is defined as the management and protection of HCA resources during a fire event.

Goals:

- Minimize the impacts of non-native plant species invasions.
- Minimize the impact of erosion.
- Manage vegetation in existing fuel zones.
- Create maps for the Fire Department of HCA access routes, sensitive species, and other pertinent information that would be necessary during a wildland fire event.

Table 12: Current Habitat Maintenance Objectives and Timeline

Habitat Maintenance Target	Objective (Obj.)	Timeline
Fuel Management	Obj. 1. Remove vegetation in prescribed fuel zones	Annually by May 15.
Non-native Plant Species	Obj. 1: Maintain less than 1 percent cover of zero tolerance species.	Annually.
	Obj. 2: Non-native weed control in occupied species habitats.	Annually or as needed.
Erosion	Obj. 1: Monitor Denning Road erosion and repair as necessary.	Annually.
	Obj. 2: Fix erosion on Xana Way slope.	To Be Determined.

A. Non-native Plant Species

The primary threat, aside from habitat loss, to all sensitive habitat and sensitive plant and animal species, is competition with non-native plant species. Non-native plant species are controlled annually and must continue to be controlled on an annual basis to maintain natural habitat extent and diversity, sensitive species health and recruitment, and ecosystem processes and functions. Management objectives focus on treatment of highly invasive plant species and the treatment of non-native, annual forbs and grasses located in occupied listed and sensitive plant habitats. Table 10 in Section V. A. lists the non-native plants, their locations, extent and the focus over the next five year period. Additionally, it is imperative for Preserve Management to identify new non-native species introductions and to control or eliminate these introductions prior to their establishment and recruitment throughout the HCA.

Objective 1. Maintain a less than one percent cover of zero tolerance non-native plant species and restore degraded habitat when feasible.

> Task 1: Control the zero tolerance species listed in Appendix H using herbicide or other appropriate management techniques. Diligence will be required to keep species like pampas grass, fountain grass, ice plant, perennial pepper weed, perennial veldt grass, Ward's weed, and onion weed under control. Cover will be determined visually.

Objective 2. Control, to the extent possible, non-native plant species that have the potential to negatively impact habitat's occupied by federally and State listed plant and animal species.

> Task 2: Control non-native plant species that occur in habitat's occupied by federally and State-listed, and sensitive plant species using herbicide or other appropriate management techniques without negatively impacting the listed species.
>
> *Methods*:

- Eradicate the Ward's weed occurrences (three locations at the Greens) to prevent spread into occupied SDTM and TLB habitats. Use the herbicide Telar and hand pulling to eradicate this plant.
- Continue to treat onion weed (one location at the Greens), perennial pepper weed (throughout the riparian area that is on the eastern side of the golf course that dissects the Greens parcels), perennial veldt grass (throughout the SMC at the Greens and along old Rancho Santa Fe Road in an old restoration site), fountain grass (east of old Rancho Santa Fe Road near the Fire Stations, in Box Canyon above the main jumping pool and along the steep slopes to the northwest of the main jumping pool), and pampas grass (throughout HCA) when these species are found as they are considered highly invasive.
- Use the "wicking method" described here, to control non-native annual forbs in SDTM habitat (the Greens) and the clay lens/non-native grassland habitat, where feasible. This method is most applicable to areas where non-native forbs grow in close proximity to SDTM. Fifty percent herbicide is mixed with 50 percent water and then put into a long plastic tube that terminates with a fabric covered porous cork. The herbicide mixture slowly flows through the cork sticking to the fabric. The mixture is then placed onto the non-native plants. It is an excellent way to treat non-native forbs in areas densely occupied by SDTM, but it is very time consuming. This method does not work for non-native grasses.
- Use a line trimmer to control non-native annual forbs in SDTM habitat and the clay lens/non-native grassland habitat, where feasible. This method is most applicable to areas where non-native forbs are much taller than SDTM, but still growing with SDTM.
- Non-native grasses should be controlled using a grass specific herbicide if it is found to be safe to use in occupied SDTM habitat.
- Treat fennel, artichoke thistle, black mustard and Italian thistle in occupied TLB and Orcutt's brodiaea habitat. Line trimmers can also be used if deemed appropriate.
- Continue to treat and hand pull Sahara mustard from Denk Mountain (on top of Mountain near the beginning of the Switchbacks Trail and where this trail meets Denning Road) and University Commons on-site parcels (directly south of the Hubbard slope, in scattered patches along DCSS habitat north of San Elijo Road, and on the Meadowlark and Wilern parcels).
- Non-native, perennial species, growing in occupied CAGN and LBV habitat, should be treated using an accepted herbicide outside of the breeding season for CAGN (September 16 – February 14) and LBV (March 15-July 15).
- All other non-native species, such as iceplant, fountain grass, eucalyptus (to the extent possible), acacia, shamal ash, and pepper trees (*Schinus* spp.), will be treated with herbicide or removed using the most appropriate method (i.e., chain saw or drill and fill), when located.

B. Erosion Control

Management of erosion to the extent possible is considered important on Denning Road and along Xana Way. Sand and gravel bags and the installation of water bars are all erosion control measures that have already been implemented on Denning Road. It is important to monitor these erosion control measures and to replace the sand and gravel bags and/or repair the water bars if necessary. The continued loss of soil from Denning Road and channelization of water down Denning Road will further increase the width and length of the gullies on this road. In time, without management, this road will be impassable. The deposition of soil from erosion on the Xana Way slope is currently cleared from the sidewalk by the City of Carlsbad. However, a long term solution to the erosion is desirable to stop the soil loss.

Objective 1. Monitor the erosion control measures on Denning Road and repair and/or replace as needed.

Objective 2. Stop or minimize the soil loss on the slope that borders Xana Way.

Method: Investigate appropriate slope stabilization techniques and/or erosion control measures. To the extent possible, fund the most appropriate and permanent erosion control measure(s).

C. Fuel Management

Fuel breaks are maintained annually, usually no later than May 15 of each year. These fuel breaks are maintained by CNLM based on a requirement from the City of Carlsbad Fire Department. Vegetation is thinned and/or removed within prescribed fuel management areas at the end of Esfera Street (Fuel Break A), along Cadencia Road (Fuel Break B), behind the homes located on El Fuerte Road (Fuel Break C) and behind several homes at the Greens, located off of Amber Lane (Fuel Break D) (Figure 13). All above ground vegetation is completely mowed down or weed whipped at Fuel Breaks A and C. Dry and dead grasses, forbs and perennial shrubs (dead) are completely mowed or removed in Fuel Breaks B and D. Alive shrubs can remain in both of these fuel break areas, but every few years the large perennial shrubs (i.e., laurel sumac) in Fuel Break B need to be trimmed back.

There are also five fuel zones on CNLM property that are managed via easement granted to neighboring HOA's (Figure 13). These easements require the HOA to conduct fuel management, but also include other responsibilities, such as slope maintenance. These are located on PA 1, PA 3, PA 5, the Winston, and south of Avenida Diestro and are the responsibility of the HOA management companies. PA 3 and 5 fuel zones are the responsibility of the Prescott Companies and the Winston and Avenida Diestro fuel management zones are the responsibility of Walter's Management. The PA1 slope area has not been assigned an HOA or management company as of the writing of this HMP, but is the responsibility of the adjacent property owner, which is currently building on the site.

D. Fire Management

Over the next five years, a map will be created depicting HCA emergency response vehicle entrance points, roads and trails to be used in the event of a fire. Additionally, sensitive plant, animal, and vegetation community locations to be avoided by tractors, graders, or emergency response vehicles will be depicted on the map. If needed, a short report or letter will be written to accompany the map. This map will be provided to the local Fire Departments. After this map has been distributed, CNLM will contact and meet with the local Fire Departments annually to discuss any fire management issues.

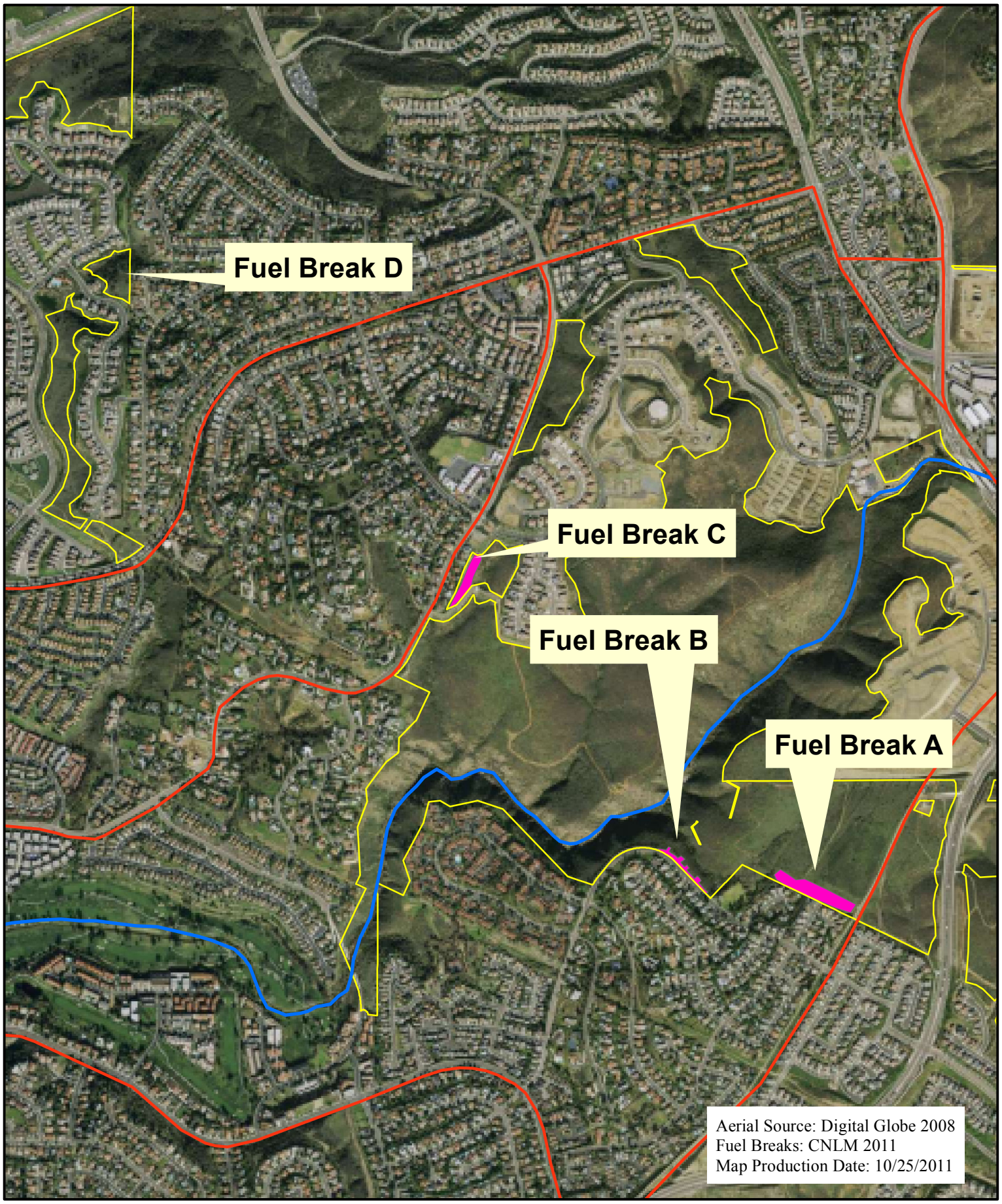

Figure 13: Fuel Break Locations
Rancho La Costa Habitat Conservation Area, CA

Meters
0 75 150 300 450 600

Center for Natural Lands Management

N

VIII. Conservation Easement Compliance

CNLM holds CEs over Elfin Forest On and Off-site parcels, the Pfau Easement (located on Mt. Whitney), and Lot 8. These are full management CEs. CNLM has created a CE compliance binder, which documents baseline conditions of the easement area and follows up with annual easement compliance visits to ensure that the underlying owner of the property does not violate the conditions of the CE. Conservation easement compliance monitoring occurs once during the year and any identified issues are resolved throughout that following year.

Obj. 1. Conduct annual CE compliance site visits.

> *Method*: Visit each CE area once during the year to conduct the CE compliance monitoring. Fill out the CE compliance monitoring form and take photographs. Resolve all identified issues throughout the subsequent year.

IX. Habitat Restoration Goals and Objectives

Habitat restoration, enhancement, or translocations have all been implemented in various locations in the HCA. Habitat restoration has either been directly handled or implemented by CNLM, the original project developer, or a public utility company. Enhancement via mitigation funding is currently occurring on the Greens parcel, and Orcutt's brodiaea and TLB mitigation translocations have occurred on the Winston and Greens parcels respectively (Table 13) in the past. Additionally, CNLM continues to receive requests from regulatory agencies, public utilities, developers and environmental consulting firms to implement habitat restoration, enhancement, and translocation projects on the HCA. This is usually a result of regulatory agencies requiring mitigation within the same watershed or on the same project parcels, translocations to existing sensitive species locations and suitable habitat, or because no other area suitable for restoration is located near the proposed project that would incur the impacts. All restoration and translocation projects that are handled by project developers are subject to five years of monitoring and maintenance funded by that project developer. In some cases the enhancement projects are also subject to five years of monitoring and maintenance, but that is not always the case. If CNLM is responsible for, and implementing the restoration, enhancement, or translocation projects, five years of monitoring and maintenance are not required because it is assumed that CNLM will be maintaining and monitoring these areas in perpetuity. The current goal for the habitat restoration, enhancement and translocation projects is to ensure that they are successful and that project proponents are held responsible for the success of their projects. Additionally, CNLM will continue to apply for grant funding to treat invasive, non-native plant species and restore degraded habitat, such as the Meadowlark parcel.

Objective 1. Continue to monitor and maintain all restoration, enhancement and translocation projects that are the responsibility of CNLM.

> Task 1. Continue to weed the Huff DCSS restoration project (old mulch facility restoration project).
> Task 2. Continue to control erosion and maintain weeds on the Hubbard Slope.
> Task 3. Continue to treat riparian and upland weed species using the Vallecitos Water District Wetland Enhancement Project and Transnet Environmental Mitigation (EMP) funding.
> Task 4. Continue to treat weeds in the Orcutt's brodiaea and TLB translocation sites.

Objective 2. Ensure success, to the extent possible, of all other non-CNLM managed restoration, enhancement and translocation projects.

> Task 1. Maintain contact with project developers and environmental consulting firms to ensure that restoration, enhancement and translocation projects are successful and that all permit-related mitigation requirements have been achieved.

Table 13: Restoration, Enhancement and Mitigation Projects

Project Type	Name	Habitat Type or Species	Location	Status	Notes
Permit Required Restoration Projects	Huff Mulch Facility	DCSS	Huff parcel in Hidden Canyon	Completed	Ongoing weed maintenance by CNLM staff as needed.
	Hubbard Slope (Hubbard Contracting mitigation project)	DCSS and Chaparral	University Commons On-site parcels	Completed	Ongoing weed maintenance and erosion control by CNLM staff as needed.
	University Commons Development Project	Upland and Wetland	The Huff parcel, Lots 8 and 11, Brouwer Quarry along San Marcos Creek, PA1 slope, and the Wilern parcel	Completed	Ongoing weed maintenance by CNLM staff as needed.
	Rancho La Costa Development Project (The Oaks, Ridges and Greens)	Wetland, Nuttall's Scrub Oak and Thread-leaf Brodiaea	The Greens parcel	Completed	Ongoing weed maintenance by CNLM staff as needed.
	Cassia Slope	Native vegetation	The Cassia parcel	Completed	Ongoing weed maintenance by CNLM staff as needed.
	Melrose Bridge/Rancho Santa Fe Road (City of Carlsbad Project)	Riparian Habitat	Brouwer Quarry (University Commons On-site)	In progress	
Enhancement Projects	Vallecitos Water District Wetland Enhancement Project	Willow Woodland	The Greens parcel	In progress	Weed maintenance included as part of the project budget.
	Transnet Environmental Mitigation Project	Onion Weed, Ward's Weed, Perennial Veldt Grass, and Perennial Pepper Weed	The Meadowlark parcel (onion weed), the Greens parcel (Ward's weed, perennial veldt grass, and perennial pepper weed), and along old Rancho Santa Fe Road (perennial veldt grass)	In progress	
Translocation Projects	Thread-leaf brodiaea translocation project	Thread-leaf Brodiaea	The Greens parcel	Completed	Ongoing weed maintenance by CNLM staff as needed.
	Orcutt's Brodiaea translocation project (University Commons Development)	Orcutt's Brodiaea	The Wilern parcel	Completed	Ongoing weed maintenance by CNLM staff as needed.
	Orcutt's Brodiaea translocation project (San Marcos, Pacific Street Development)	Orcutt's Brodiaea	The Wilern parcel	Completed	Ongoing weed maintenance by CNLM staff as needed.
Mitigation Projects	City Ventures Mitigation Project	DCSS and SMC	The Greens parcel	In progress	

Objective 3. Continue to apply for grant funding to treat invasive, non-native plants and restore degraded habitats.

Task 1. Apply for funding to restore the Meadowlark parcel. This includes ongoing treatment of onion weed that is currently being treated using Transnet EMP funding.
Task 2. Apply for grant funding to continue the treatment of invasive, non-native plants, like Ward's weed and perennial pepper weed.

X. Public Use Goals and Objectives

Public use management includes patrolling, trail maintenance, sign, gate and fence maintenance and public outreach. It is important to patrol so that trash can be collected, issues and threats can be identified, and public contact can be initiated. Maintenance of trails, signage, gates and fences is equally important for public safety and protection of sensitive habitats and plants and animals.

A. Trails and Kiosks

There are many trails used by the public for recreational purposes including hiking, mountain bike riding, and horseback riding (Figure 14). Off-highway vehicle use (OHV), hunting, paint ball and air soft games, target practice (bow and arrow and firearms), smoking, and trail usage before dawn and after dusk, are all prohibited activities. Horseback riding is only allowed on a small portion of the trail system (Figure 14). Many informative signs have been placed in various locations throughout the HCA. These signs help guide the public while they use the trail system and also indicate the areas that are off limits to the public. Fences have also been strategically placed to keep the public off of adjacent private land, out of sensitive habitats, or away from dangerous areas. Portions of the trail system are maintained by the Cities of Carlsbad and San Marcos as part of a trails easement agreement with these two cities (Figure 14). The remainder of the trail system is maintained by CNLM staff. There are eighteen kiosks that depict the trail system, list trail uses and prohibitions, CNLM and City contact information (if appropriate), and miscellaneous biological and ecological preserve information (Figure 14). CNLM staff is responsible for replacing all of the kiosk material on a quarterly basis. The City of Carlsbad parks and recreation contact is Liz Ketabien and the City of San Marcos parks and recreation contact is Craig Sargent-Beach. Their contact information is listed in Section G.

Objective 1. Monitor trail erosion, signage, fences, and kiosk condition.

Method 1: Regularly walk the trail system to check on signage, fences, stairs and trail erosion. Replace damaged or vandalized signage and fences. Work with the City of Carlsbad and San Marcos to replace trail markers, fix trail erosion and to coordinate trail maintenance. Fix vandalized kiosks and replace them if necessary. Replace kiosk literature quarterly. Literature can include species and habitat descriptions, research abstracts, maps, HCA rules and regulations, and any other new or updated information that may be helpful and informative to the public.

Method 2: Continue to enlist volunteers to maintain the current trail system. Maintain relationships with the San Diego Mountain Biking Association, local schools, and the Boy Scouts. Utilize these groups for trail work days and public outreach.

B. Patrol

Over the last five years, much potential trespass and associated HCA impact have been prevented and reduced. For example, CNLM has been very successful in deterring trespass into Box Canyon. This has been accomplished by CNLM staff staging at the trespass entry locations (Cadencia Street/Piragua Street and the west Ridgeline Trail area) and dissuading would-be trespassers with a bull horn or via direct contact. Approximately 15 to 20 hours per week are spent during the summer months at Box Canyon deterring trespassers. If trespassers do enter Box Canyon, CNLM is called to apprehend the trespassers and the City of Carlsbad Police Department are called to issue citations. Regular monthly patrols of Denk Mountain, Choumass-pappas and other areas has also limited problems and impacts.

Figure 14 - Trails and Kiosk Locations

Even through CNLM has been very successful in dissuading unwanted and illegal activities, problems still exist, including illegal trail and jump creation, OHV use, and dogs-off-leash. Regular patrols, enforcement actions, and public outreach have reduced these problems, but the HCA is still the main attraction for adjacent homeowners and the mountain biking community. In addition, there continues to be sporadic problems with dumping.

Objective 1. Limit and minimize unwanted activities by conducting regular patrols.

> Task1: Conduct regular patrols to locate and dissuade illegal uses such as illegal trail and jump creation, OHV use, dogs-off-leash, and dumping.

Objective 2. Continue to work with the City of Carlsbad Police Department on coordination of trespass citations for Box Canyon.

> Task 1. During the summer months, increase patrol activities in the Box Canyon area (several times a week), respond to calls that report trespass into Box Canyon, and involve the City of Carlsbad Police Department in the issuance of citations for trespass into Box Canyon.

C. Outreach

Public contact and outreach are imperative to long term management success. The public uses the HCA daily and is sometimes aware of problems before CNLM management staff. The public can become the CNLM's best advocate if education is frequent, up to date, and delivered in a professional and friendly manner (i.e., polite and direct contact, updated literature, flyers and letters). Public outreach over the next five years will focus on public contact during routine patrols, updating kiosk literature, contact via nature hikes and annual trail work days, and contact with and continued usage of volunteers.

Objective 1. Continue to inform the public about the HCA purpose and protected biological values.

> Task 1: Maintain kiosk literature and information quarterly.
> Task 2: Host at least one volunteer work day a year and provide several nature walks over the five-year period.
> Task 3: Initiate public outreach during patrol activities.
> Task 4: Continue to search for creative outreach project and events, such as Boy and Girl Scout projects.

XI. General Maintenance

Several post and rope fences, wooden fences, small and large segments of barbed wire fences, several gates, barrier posts, and many signs are maintained on the property. Several fences are located on Denk Mountain (east and west sides, along the Mule Deer Trail and along Denning Road), three are located at University Commons on-site (Brouwer Quarry, north and south sides and adjacent to the Wilern parcel), several are located along the east and west Ridgeline Trail areas, one is located at the Huff parcel, and one is located at the Elfin Forest off-site parcel. The barrier posts are located at Choumass-Pappas. The fences, gates and signs will be maintained over the next five years. Trash dumping is always a problem, especially at Elfin Forest off-site and the Choumass-papas parcels. Trash will be removed during regular patrols, or neighbors that are responsible for the dumping will be contacted to have them do the removal. No new fences, gates or signs are proposed for installation at this time. Only maintenance of the existing fences, gates, and signs will occur over the next five years.

XII. Funding, Operations, and Staffing

A. Funding and Budgets

Preserve management was funded by endowments set aside by the RECMC, Brookfield Homes, Scandia Development, the NFWF, and Cassia Professional Offices. Other funding mechanisms include volunteerism, public and private donations or grants from wildlife groups or entities.

Funding is separated into two broad categories, Initial and Capital, and Ongoing. Initial and Capital funds are generally used for the first three years of management. Ongoing represents funds generated from interest earned from our endowments. The Cassia property, is the only property where Initial and Capital funding is still being used. All other Initial and Capital was spent by 2004. Our budgets are now comprised of interest earned from the endowments. The Center spends about 4.5% of interest generated by the endowment each year for management purposes.

The total funding as of September 30, 2011 is shown in Table 14. The Center also holds money for the restoration projects located on the Huff property, Hubbard project, and other miscellaneous restoration and enhancement projects located throughout the HCA (discussed in Section VII.).

Table 14: Endowment Status*

Property	Inception Date	Original Endowment	Endowment	Initial & Capital	Total Preserve Funds
Nelson	6/2001	72,180	73,795		73,795
La Costa	2/2002	1,364,400	1,505,355		1,505,355
University Commons	3/2002	623,954	660,125		660,125
Elfin Forest	8/2002	104,600	130,452		130,452
Cassia	1/2007	100,844	100,323	2,053	102,376
Meadowlark	3/2009	11,631	9,960		9,960

*data as of 9/30/2011

B. Operations

Operations include the training and professional development of Preserve Management personnel, and inspection of the HCA by CNLM administration. Funds are allocated each fiscal year for CNLM management staff to attend classes or seminars and to receive any required training which could include continuing education to maintain permits and safety training. Also included within this category are annual employee reviews.

C. Staffing

The Preserve Manager is supervised by the San Diego Regional Preserve Manager, Markus Spiegelberg and the Director of Conservation Science, Dr. Deborah Rogers. Tasks and priorities will be coordinated and approved by the San Diego Regional Preserve Manager. Additionally, the Director of Conservation Science will assist with document review and scientific research conducted on CNLM preserves.

XIII. Reporting Requirement

Reporting activities include management plan and report writing, all data analysis, GIS data gathering, compilation, and analysis, meetings and regional coordination, and photographs. All reporting requirements will be accomplished on an annual basis.

A. Management Plans

This HMP represents the third plan produced for the HCA. The next plan will be produced in 2016 and will summarize work activities from the previous five year period and will provide direction and time lines for future work. The next HMP will cover all properties listed in this HMP and any new properties acquired by CNLM. It will also provide budget and financial information.

B. Annual Reports and Work Plans

An annual management and monitoring report and work plan will be prepared and provided to the City of Carlsbad by November 1, and City of San Marcos, USFWS and the CDFG by December 31 of each year. The reporting/fiscal year is October 1 to September 30. The report will reflect the previous reporting year and the work plan will reflect the current reporting year. The annual report will include:

1. An accounting of management funds expended during the previous year and the status of the endowment.
2. A general description of the status of biological resources.
3. Biological monitoring methods, analyses and results.
4. A description of management actions conducted within the fiscal year.
5. A description of problems, if any, encountered in managing the HCA.
6. A description of management actions CNLM expects to undertake in the coming year.
7. Pertinent photographs.

The annual work plan will describe management actions CNLM expects to undertake in the current year.

C. Data Management

Data derived from routine patrols and biological surveys will be entered into and maintained in the HCA's existing database and GIS. The current GIS databases include sensitive animals and plants, vegetation communities, long-term monitoring plots, and HCA boundaries. As new information is acquired, these databases are updated. In some cases, the databases are updated annually (sensitive animals and plants). In other cases, updating of databases occurs as information is received, corrected or amended (vegetation communities and boundaries). Efforts are always made to coordinate and standardize GIS database fields and parameters so that information can be shared with other groups or regulatory agencies.

D. Meetings and Regional Coordination

CNLM staff regularly attend meetings organized by regulatory agencies, research groups, other non-profit organizations, consultants, Cities, and Counties. In some cases CNLM staff organize these meetings and in other cases, CNLM staff either participate in, or attend, these meetings. A summary of these meetings, depending on importance, is occasionally included in annual or quarterly reports.

XIV. References

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XV. Appendices

Appendix A - Animal Species List

WILDLIFE SPECIES LIST (2000-2011)

Invertebrates

Butterflies

Latin Name	Common Name	Latin Name	Common Name
Anthocharis sara	Sara Orangetip	*Nymphalis antiopa*	Mourning Cloak
Apodemia mormo virgulti	Behr's Metalmark	*Papilio zelicaon zelicaon*	Anise Swallowtail
Brephidium exilus	Pygmy Blue	*Pieris rapae*	Cabbage White
Callophrys affinis perplexa	Perplexing Hairstreak	*Pontia protodice*	Common White
Coenonympha californica	California Ringlet	*Vanessa carye anabella*	West Coast Lady
Glaucopsyche lygdamus australis	Southern Blue	*Vanessa cardui*	Painted Lady
Liminitis lorquini lorquini	Lorquin's Admiral		

Ants

Latin Name	Common Name	Latin Name	Common Name
Camponatus sp	Ant	*Myrmecocystus testaceus*	Ant
Crematogaster californica	Ant	*Pheidole vistana*	Ant
Dorymyrmex insanus	Ant	*Prenolepis impairia*	Ant
Linepithema humile	Argentine Ant	*Solenopsis xyleni*	Ant
Messor andrei	Harvester Ant	*Tapinoma sessile*	Ant

Other

	Common Name		Common Name
	Jerusalem Cricket		Dung Beetle
	Stink Bugs		Wholly Bears
	Centipede		Scorpions
	Millipede		

Vertebrates

Reptiles and Amphibians

Latin Name	Common Name	Latin Name	Common Name
Aspidoscelis (Cnemidophorus) hyperythra beldingi	Orange-throated Whiptail	*Masticophis lateralis*	Striped Racer
Aspidoscelis (Cnemidophorus) tigris	California Whiptail	*Phrynosoma coronatum blainvillii*	San Diego horned lizard
Crotalus ruber ruber	Northern Red Diamond Rattlesnake	*Pituophis melanoleucus*	Gopher Snake
Crotalus viridis helleri	Southern Pacific Rattlesnake	*Scaphiopus hammondii*	Western Spadefoot Toad
Elgaria multicarinata	Southern Alligator Lizard	*Sceloporus occidentalis*	Western Fence Lizard
Eumeces gilberti rubricaudatus	Gilbert's skink	*Tantilla planiceps*	Black-headed snake
Eumeces skiltonianus	Western skink	*Uta stansburiana*	Side-blotched Lizard
Hyla (*Pseudacris*) *regilla*	Pacific Treefrog		

Birds			
Latin Name	**Common Name**	**Latin Name**	**Common Name**
Accipiter cooperi	Cooper's Hawk	*Hirundo pyrrhonota*	Cliff Swallow
Accipiter striatus	Sharp-shinned Hawk	*Icteria verens auricollis*	Yellow-breasted chat
Aeronautes saxatalis	White-throated Swift	*Icterus cucullatus nelsoni*	Hooded oriole
Aimophila ruficeps canescens	Southern California rufous-crowned Sparrow	*Lanius ludovicianus*	Loggerhead shrike
Ammodramus savannarum	Grasshopper Sparrow	*Melanerpes formicivorus bairdi*	Acorn woodpecker
Amphispiza belli belli	Bell's sage sparrow	*Melospiza melodia*	Song Sparrow
Anas platyrhynchos platyrhnchos	Mallard	*Mimus polyglottos*	Northern Mockingbird
Aphelocoma coerulescens	Scrub Jay	*Mniotilta varia*	Black and white warbler
Aquila chrysaetos canadensis	Golden eagle	*Molothrus ater*	Brown-headed cowbird
Archilochus costae	Costa's hummingbird	*Myiarchus cinerascens*	Ash-throated Flycatcher
Ardea alba	Great egret	*Pandion haliaetus carolinensis*	Osprey
Ardea herodias	Great Blue Heron	*Passerina amoena*	Lazuli bunting
Bubo virginianus	Great Horned Owl	*Passerina caerulea salicaria*	Blue grosbeak
Buteo jamaicensis	Red-tailed Hawk	*Picoides nuttallii*	Nuttall's Woodpecker
Buteo lineatus	Red-shouldered Hawk	*Pipilo crissalis*	California Towhee
Butorides striatus	Green heron	*Pipilo maculatus*	Spotted Towhee
Callipepla californica	California Quail	*Polioptila caerulea*	Blue-gray Gnatcatcher
Calypte anna	Anna's Hummingbird	*Polioptila californica californica*	Coastal California Gnatcatcher
Carduelis psaltria	Lesser Goldfinch	*Psaltriparus minimus*	Bushtit
Carpodacus mexicanus	House Finch	*Salpinctes mexicanus conspersus*	Canyon wren
Cathartes aura	Turkey Vulture	*Salpinctes obsoletus obsoletus*	Rock wren
Ceryle alcyon	Belted kingfisher	*Sayornis nigricans*	Black Phoebe
Chamaea fasciata	Wrentit	*Sayornis saya*	Say's Phoebe
Charadrius vociferous vociferus	Killdeer	*Sturnella neglecta*	Western Meadowlark
Circus cyaneus	Northern Harrier	*Thryomanes bewickii*	Bewick's Wren
Colaptes auratus	Northern Flicker	*Toxostoma redivivum*	California Thrasher
Corvus brachyrhynchos	American Crow	*Trogolodytes aedon parkmanii*	House wren
Corvus corax	Common Raven	*Tyrannus verticalis*	Western Kingbird
Dendrocopos nuttalii	Nuttal's woodpecker	*Tyrannus vociferans*	Cassin's Kingbird
Dendroica coronata	Yellow-rumped Warbler	*Tyto alba*	Common Barn Owl
Dendroica petechia	Yellow warbler	*Vireo bellii pusillus*	Least bell's vireo
Elanus leucurus majusculus	White-tailed Kite	*Vermivora celata*	Orange-crowned Warbler
Empidonax difficilis	Pacific Slope Flycatcher	*Zenaida macroura*	Mourning Dove
Eremophila alpestris	Horned lark	*Zonotrichia leucophrys*	White-crowned Sparrow
Falco sparverius	American Kestrel		
Geococcyx californianus	Greater Roadrunner		
Geothlypis trichas	Common yellowthroat		

Mammals			
Latin Name	**Common Name**	**Latin Name**	**Common Name**
Canis latrans	Coyote	*Odocoileus hemionus*	Mule Deer
Chaetodipus fallax	San Diego Pocket Mouse	*Peromyscus eremicus*	Cactus Mouse
Didelphis virginiana	Virginia Opossum	*Peromyscus maniculatus*	Deer Mouse
Dipodomys simulens	Delzura Kangaroo Rat	*Reithrodontomys megalotis*	Western Harvest Mouse
Felis concolor	Mountain Lion	*Sorex ornatus*	Ornate Shrew
Felis rufus	Bobcat	*Spermophilus beecheyi*	California Ground Squirrel
Lepus californicus bennettii	Black-tailed Jack Rabbit	*Sylvilagus audubonii*	Audubon's Cottontail
Mustela frenata	Long-tailed Weasel	*Thomomys bottae*	Botta's Pocket Gopher
Neotoma lepida intermedia	San Diego Desert Woodrat		

Appendix B - Plant Species List

Rancho La Costa Species List (Updated 2010)

Arranged alphabetically by family.

Family and Latin Name	Common Name
ADOXACEAE — Adoxa Family	
Sambucus mexicana	BLUE ELDERBERRY
AGAVACEAE — Agave Family	
Hesperoyucca whipplei	CHAPARRAL CANDLE
Yucca schidigera	MOHAVE YUCCA
AIZOACEAE — Fig-Marigold Family	
**Carpobrotus chilensis*	SEA-FIG
**Carpobrotus edulis*	HOTTENTOT-FIG
**Mesembryanthemum crystallinum*	CRYSTALLINE ICEPLANT
ALLIACEAE — Onion Family	
Allium ssp.	ONION
Allium haematochiton	REDSKIN ONION
Allium praecox	EARLY ONION
AMARANTHACEAE - Amaranth Family	
**Amaranthus albus*	WHITE TUMBLEWEED
Atriplex sp.	SALTBUSH
Atriplex lentiformis	BIG SALTBUSH
**Atriplex semibiccata*	AUSTRALIAN SALTBUSH
**Chenopodium album*	LAMB'S QUARTERS
**Chenopodium murale*	NET-LEAF GOOSEFOOT
**Dysphania ambrosioides*	MEXICAN TEA
**Salsola tragus*	PRICKLY RUSSIAN-THISTLE, TUMBLEWEED
Sarcoconia pacifica	PACIFIC PICKLEWEED
ANACARDIACEAE - Sumac or Cashew Family	
Malosma laurina	LAUREL SUMAC
Rhus integrifolia	LEMONADEBERRY
**Schinus terebinthifolius*	BRAZILIAN PEPPER TREE
Toxicodendron diversilobum	WESTERN POISON-OAK
APIACEAE — Carrot Family	
Apiastrum angustifolium	MOCK-PARSLEY
**Apium graveolens*	COMMON CELERY
**Conium maculatum*	COMMON POISON HEMLOCK
Daucus pusillus	RATTLESNAKE WEED
**Foeniculum vulgare*	SWEET FENNEL
Lomatium dasycarpum ssp.*dasycarpum*	WOOLLY-FRUIT LOMATIUM
Sanicula arguta	SHARP TOOTH SANICLE
Sanicula bipinnatifida	PURPLE SANICLE
**Torilis arvensis*	JAPANESE HEDGE-PARSLEY

Family and Latin Name	Common Name
APOCYNACEAE — Dogbane Family	
Asclepias fascicularis	NARROW-LEAF MILKWEED
ARECACEAE — Palm Family	
**Phoenix canariensis*	CANARY ISLAND DATE PALM
**Washingtonia robusta*	MEXICAN FAN PALM
ASPHODELACEAE — Asphodel Family	
**Asphodelus fistulosus*	HOLLOW-STEM ASPHODEL
ASTERACEAE — Sunflower Family	
Achillea millefolium	YARROW, MILFOIL
Acourtia microcephala	SACAPELLOTE
Ambrosia psilostachya	WESTERN RAGWEED
Ancistrocarphus filagineus	WOOLLY FISHHOOKS
Artemisia californica	COASTAL SAGEBRUSH
Artemisia douglasiana	DOUGLAS MUGWORT
Artemisia palmeri	PALMER'S SAGEWORT
Baccharis pilularis	CHAPARRAL BROOM, COYOTE BRUSH
Baccharis salicifolia	MULE-FAT, SEEP-WILLOW
Baccharis sarothroides	BROOM BACCHARIS
Bahiopsis laciniata	SAN DIEGO SUNFLOWER
Brickellia californica	CALIFORNIA BRICKELLBUSH
**Carduus pycnocephalus*	ITALIAN THISTLE
**Centaurea calcitrapa*	PURPLE STAR-THISTLE
**Centaurea melitensis*	TOCALOTE
Chaenactis artemisiifolia	WHITE PINCUSHION
Chaenactis glabriuscula	PINCUSHION
**Chrysanthemum coronarium*	CROWN MARIGOLD
Cirsium occidentale var. *occidentale*	COBWEBBY THISTLE
Conyza canadensis	HORSEWEED
Corethrogyne filaginifolia var. *californica*	CALIFORNIA SAND-ASTER
**Cotula australis*	AUSTRALIAN BRASS-BUTTONS
**Cotula coronopifolia*	AFRICAN BRASS-BUTTONS
**Cynara cardunculus*	ARTICHOKE THISTLE
Deinandra fasciculata	FASCICLED TARWEED
**Dimorphotheca sinuata*	BLUE-EYE CAPE-MARIGOLD
Encelia californica	CALIFORNIA ENCELIA
Erigeron foliosus var. *foliosus*	LEAFY DAISY
Eriophyllum confertiflorum var. *confertiflorum*	LONG-STEM GOLDEN-YARROW
Filago arizonica	ARIZONA FILAGO
Filago californica	CALIFORNIA FILAGO
**Filago gallica*	NARROW-LEAF FILAGO

Family and Latin Name	Common Name
**Gazania* spp.	AFRICAN DAISY
Gnaphalium californicum	CALIFORNIA EVERLASTING
Gnaphalium palustre	LOWLAND CUDWEED
Gnaphalium ramosissiumum	PINK EVERLASTING
Gnaphalium stramineum	COTTON-BATTING PLANT
Grindelia camporum	RAYLESS GUMPLANT
Gutierrezia sarothrae	BROOM MATCHWEED/SNAKEWEED
Hazardia orcuttii	ORCUTT'S GOLDENBUSH
Hazardia squarrosa var. *squarrosa*	SAWTOOTH GOLDENBUS
**Hedypnois cretica*	CRETE HEDYPNOIS
Hesperevax sparsiflora var. *sparsiflora*	ERECT EVAX
Heterotheca grandiflora	TELEGRAPH WEED
**Hypochaeris glabra*	SMOOTH CAT'S EAR
Isocoma menziesii var. *menziesii*	SPREADING GOLDENBUSH
Iva hayesiana	SAN DIEGO MARSH-ELDER
**Lactuca serriola*	PRICKLY LETTUCE
Lasthenia gracilis	COMMON GOLDFIELDS
Layia platyglossa	TIDY TIPS
Mircoseris douglasii var. playcarpha	SMALL FLOWERED MICROSERIS
Microseris elegans	ELEGANT MICROSERIS
Osmadenia tenella	OSMADENIA
Pentachaeta aurea	GOLDEN-RAY PENTACHAETA
**Picris echioides*	BRISTLY OX-TONGUE
Pluchea odorata	SALT MARSH FLEABANE
Porophyllum gracile	ODORA
Pseudognaphalium beneolens	FRAGRANT EVERLASTING
Pseudognaphalium biolettii	BICOLOR CUDWEED
Pseudognaphalium microcephalum	WHITE EVERLASTING
Rafinesquia californica	CALIFORNIA CHICORY
Senecio californicus	CALIFORNIA BUTTERWEED
**Senecio linearifolius* var. *linearifolius*	FIREWEED
**Senecio vulgaris*	COMMON GROUNDSEL
**Silybum marianum*	MILK THISTLE
**Sonchus asper* ssp. *asper*	PRICKLY SOW-THISTLE
**Sonchus oleraceus*	COMMON SOW-THISTLE
Stephanomeria diegensis	SAN DIEGO WREATH-PLANT
Stylocline gnaphaloides	EVERLASTING NEST-STRAW
Uropappus lindleyi	SILVER PUFFS
Venegasia carpesioides	JESUIT FLOWER
Xanthium strumarium	COCKLEBUR

Family and Latin Name	Common Name
BORAGINACEAE — Borage Family	
Amsinckia spp.	FIDDLENECK
Amsinckia menziesii var. *intermedia*	RANCHER'S FIDDLENECK
Cryptantha clevelandii ssp. clevelandii	CLEVELAND'S CRYPTANTHA
Cryptantha intermedia	NIEVITAS CRYPTANTHA
Cryptantha micromeris	MINUTE-FLOWER CRYPTANTHA
Cryptantha microstachys	TEJON CRYPTANTHA
Cryptantha muricata	PRICKLY CRYPTANTHA
**Echium candicans*	PRIDE OF MADEIRA
Harpagonella palmeri	PALMER'S GRAPPLING-HOOK
Heliotropium curassavicum	SALT HELIOTROPE
Pectocarya linearis ssp ferrocula	SLENDER PECTOCARYA
Pectocarya peninsularis	PENINSULAR PECTOCARYA
Plagiobothrys arizonicus	ARIZONA POPCORNFLOWER
Plagiobothrys collinus var. gracilis	SAN DIEGO POPCORNFLOWER
Plagiobothrys nothofulvus	RUSTY POPCORNFLOWER
BRASSICACEAE — Mustard Family	
**Brassica nigra*	BLACK MUSTARD
**Brassica tournefortii*	SAHARAN MUSTARD
**Capsella bursa-pastoris*	SHEPHERD'S PURSE
Cardamine californica var. *californica*	MILKMAIDS, TOOTHWORT
**Carrichtera annua*	WARD'S WEED
Caulanthus heterophyllus var. *heterophyllus*	SAN DIEGO JEWELFLOWER
**Coronopus didymus*	LESSER WART-CRESS
**Hirschfeldia incana*	SHORT-POD MUSTARD
**Lepidium latifolium*	BROAD-LEAF PEPPERGRASS
Lepidium nitidum var. nitidum	SHINING PEPPERGRASS
Lepidium virginicum var. *robinsonii*	ROBINSON'S PEPPERGRASS
**Lobularia maritima*	SWEET ALYSSUM
**Raphanus sativus*	WILD RADISH
Rorippa nasturtium-aquaticum	WATER-CRESS
**Opuntia ficus-indica*	MISSION PRICKLY-PEAR, INDIAN-FIG
Opuntia littoralis	COAST PRICKLY-PEAR
CAMPANULACEAE - Bellflower Family	
Triodanis biflora	SMALL VENUS LOOKING-GLASS
CAPPARACEAE — Caper Family	
Isomeris arborea	BLADDERPOD
CAPRIFOLIACEAE - Honeysuckle Family	
Lonicera subspicata	HONEYSUCKLE
CARYOPHYLLACEAE — Pink Family	

Family and Latin Name	Common Name
Cardionema ramosissima	TREAD LIGHTLY
**Cerastium glomeratum*	MOUSE-EAR CHICKWEED
Polycarpon depressum	CALIFORNIA POLYCARP
**Silene gallica*	COMMON CATCHFLY
Silene laciniata ssp. *laciniata*	SOUTHERN PINK
**Spergularia villosa*	VILLOUS SAND-SPURRY
**Stellaria media*	COMMON CHICKWEED
CISTACEAE — Rock-Rose Family	
Helianthemum scoparium	PEAK RUSH-ROSE
CONVOLVULACEAE — Morning-Glory Family	
Calystegia macrostegia	MORNING-GLORY
**Convolvulus arvensis*	FIELD BINDWEED
Convolvulus simulans	SMALL-FLOWERED MORNING GLORY
Cuscuta californica	DODDER
Dichondra occidentalis	WESTERN DICHONDRA/PONYFOOT
CRASSULACEAE — Stonecrop Family	
Crassula connata	PYGMYWEED
Dudleya edulis	LADIES' FINGERS
Dudleya lanceolata	LANCE-LEAF DUDLEYA
Dudleya pulverulenta	CHALK DUDLEYA
Dudleya viscida	STICKY DUDLEYA
CUCURBITACEAE — Gourd Family	
Marah macrocarpus var. *macrocarpus*	MANROOT, WILD-CUCUMBER
CYPERACEAE — Sedge Family	
Carex spissa	SAN DIEGO SEDGE
Carex triquetra	TRIANGULAR-FRUIT SEDGE
**Cyperus ssp.*	UMBRELLA PLANT
Cyperus eragrostis	TALL FLATSEDGE
**Cyperus involucratus*	AFRICAN UMBRELLA PLANT
Eleocharis aciculatus	NEEDLE SPIKE-RUSH
Eleocharis macrostachya	PALE SPIKE-RUSH
Schoenoplectus americanus	OLNEY'S BULRUSH
Schoenoplectus californicus	CALIFORNIA BULRUSH
Schoenoplectus pungens	COMMON THREESQUARE
DRYOPTERIDACEAE — Wood Fern Family	
Dryopteris arguta	COASTAL WOOD FERN
ERICACEAE — Heath Family	
Arctostaphylos glandulosa ssp. *crassifolia*	DEL MAR MANZANITA
Arctostaphylos glandulosa ssp. *glandulosa*	EASTWOOD MANZANITA
Comarostaphylis diversifolia ssp. *diversifolia*	SUMMER-HOLLY

Family and Latin Name	Common Name
Xylococcus bicolor	MISSION MANZANITA
EUPHORBIACEAE — Spurge Family	
Chamaesyce albomarginata	WHITE-MARGIN SANDMAT
Chamaesyce polycarpa	SMALL-SEED SANDMAT
Croton californicus	CALIFORNIA CROTON
Croton setigerus	DOVEWEED
**Euphorbia peplus*	PETTY SPURGE
**Ricinus communis*	CASTOR BEAN
FABACEAE - Legume Family	
**Acacia spp.*	ACACIA
Astragalus didymocarpus var. didymocarpus	WHITE DWARF LOCOWEED
Lathyrus latifolius	PERENNIAL PEA
Lathyrus vestitus var. *alefeldii*	SAN DIEGO SWEET PEA
Lotus hamatus	LOTUS
Lotus salsuginosus var. salsuginosus	ALKALI LOTUS
Lotus scoparius	DEERWEED
Lotus strigosus	BISHOP'S/STRIGOSE LOTUS
Lupinus bicolor	MINIATURE LUPINE
Lupinus concinnus	BAJADA LUPINE
Lupinus hirsutissimus	STINGING LUPINE
Lupinus truncatus	COLLAR LUPINE
Lupinus sparsifolius	COULTER'S LUPINE
**Medicago polymorpha*	CALIFORNIA BURCLOVER
**Melilotus albus*	WHITE SWEET CLOVER
**Melilotus indicus*	INDIAN SWEET CLOVER
**Melilotus officinalis*	YELLOW SWEETCLOVER
Trifolium depauperatum	BALLOON-SACK CLOVER
Trifolium gracilentum var. gracilentum	PIN-POINT CLOVER
Trifolium microcephalum	MAIDEN CLOVER
Trifolium willdenovii	VALLEY CLOVER
Vicia ludoviciana var. ludoviciana	DEER PEA VETCH
FAGACEAE — Oak Family	
Quercus agrifolia var. *agrifolia*	COAST LIVE OAK, ENCINA
Quercus berberidifolia	INLAND SCRUB OAK
Quercus dumosa	NUTTALL'S SCRUB OAK
Quercus engelmannii	ENGELMANN'S/MESA BLUE OAK
GENTIANACEAE — Gentian Family	
Centaurium venustum	CANCHALAGUA
GERANIACEAE — Geranium Family	
**Erodium botrys*	LONG-BEAK FILAREE/STORKSBILL

Family and Latin Name	Common Name
**Erodium cicutarium*	RED-STEM FILAREE/STORKSBILL
**Erodium moschatum*	WHITE-STEM FILAREE/STORKSBILL
Geranium carolinianum	CAROLINA GERANIUM
GROSSULARIACEAE — Gooseberry Family	
Ribes indecorum	WHITE-FLOWER CURRANT
Ribes speciosum	FUCHSIA-FLOWER GOOSEBERRY
HYACINTHACEAE — Hyacinth Family	
Chlorogalum parviflorum	SOAP-PLANT/AMOLE
Chlorogalum pomeridianum var. *pomeridianum*	WAVY-LEAF SOAP-PLANT/AMOLE
Emmenanthe penduliflora var. *penduliflora*	WHISPERING BELLS
HYDROPHYLLACEAE — Waterleaf Family	
Eucrypta chrysanthemifolia var. chrysanthemifolia	COMMON EUCRYPTA
Nemophilla sp.	BLUE EYES
Phacelia cicutaria	CATERPILLAR PHACELIA
Phacelia distans	WILD-HELIOTROPE
Phacelia parryi	PARRY'S PHACELIA
Pholistoma auritum	FIESTA FLOWER
Pholistoma racemosum	FIESTA FLOWER
IRIDACEAE — Iris Family	
Sisyrinchium bellum	BLUE-EYED-GRASS
JUNCACEAE — Rush Family	
Juncus acutus ssp. *leopoldii*	SOUTHWESTERN SPINY RUSH
Juncus arcticus var. *mexicanus*	MEXICAN RUSH
Juncus bufonius	TOAD RUSH
Juncus dubius	MARIPOSA RUSH
Juncus xiphioides	IRIS-LEAF RUSH
LAMIACEAE — Mint Family	
Acanthomintha ilicifolia	THORNMINT
**Marrubium vulgare*	HOREHOUND
**Mentha spicata var. spicata*	SPEARMINT
Salvia apiana	WHITE SAGE
Salvia columbariae	CHIA
Salvia mellifera	BLACK SAGE
Scutellaria tuberosa	DANNY'S SKULLCAP
Stachys ajugoides var. *rigida*	WHITE HEDGE-NETTLE
Trichostema lanceolatum	VINEGAR WEED
LILIACEAE — Lily Family	
Calochortus splendens	SPLENDID MARIPOSA LILY
*Fritillaria biflora*var. *biflora*	CHOCOLATE LILY
LYTHRACEAE — Loosestrife Family	

Family and Latin Name	Common Name
**Lythrum hyssopifolia*	GRASS POLY
MALVACEAE — Mallow Family	
Malacothamnus fasciculatus	CHAPARRAL BUSHMALLOW
**Malva parviflora*	CHEESEWEED
Sidalcea malveflora ssp. *sparsifolia*	CHECKER-BLOOM
MELANTHIACEAE — Bunch Flower or Camas Family	
Zigadenus fremontii	FREMONT'S CAMAS
MYRTACEAE — Myrtle Family	
**Eucalyptus globulus*	BLUE GUM
NYCTAGINACEAE — Four O'clock Family	
Mirabilis laevis	COASTAL WISHBONE PLANT
OLEACEAE — Olive Family	
**Fraxinus uhdei*	SHAMAL ASH
**Olea europaea*	OLIVE
ONAGRACEAE — Evening-Primrose Family	
Camissonia bistorta	SUN CUP
Camissonia californica	FALSE-MUSTARD
Clarkia purpurea ssp. *viminea*	LARGE CLARKIA
Epilobium brachycarpum	SUMMER COTTON WEED
Epilobium canum	CALIFORNIA FUCHSIA, ZAUSCHNERIA
Epilobium ciliatum ssp. *ciliatum*	WILLOW HERB
Oenothera elata	GREAT MARSH EVENING-PRIMROSE
OPHIOGLOSSACEAE — Adder's Tongue Family	
Ophioglossum californicum	CALIFORNIA ADDER'S TONGUE
OROBANCHACEAE — Broom-Rape Family	
Castilleja exserta	PURPLE OWL'S CLOVER
Castilleja foliolosa	WOOLLY INDIAN PAINTBRUSH
Cordylanthus rigidus ssp. *setigerus*	DARK-TIP BIRD'S BEAK
Orobanche fasciculata	CLUSTERED BROOM-RAPE
OXALIDACEAE — Oxalis Family	
**Oxalis pes-caprae*	BERMUDA-BUTTERCUP
Oxalis albicans ssp. *californica*	CALIFORNIA WOOD-SORREL
PAEONIACEAE — Peony Family	
Paeonia californica	CALIFORNIA PEONY
PAPAVERACEAE — Poppy Family	
Eschscholzia californica	CALIFORNIA POPPY
Papaver californicum	FIRE POPPY
Platystemon californicus	CREAM CUPS
Stylomecon heterophylla	WIND POPPY
PHRYMACEAE — Hopseed Family	

Family and Latin Name	Common Name
Mimulus aurantiacus var. *puniceus*	MONKEY FLOWER
Mimulus guttatus	SEEP MONKEY FLOWER
PLANTAGINACEAE — Plantain Family	
Antirrhinum kellogii	CLIMBING SNAPDRAGON
Antirrhinum nuttallianum ssp. *nuttallianum*	NUTTALL'S SNAPDRAGON
Collinsia heterophylla	CHINESE HOUSES
Keckiella cordifolia	CLIMBING BUSH PENSTEMON
Linaria canadensis	LARGE BLUE TOADFLAX
Plantago erecta	DOT-SEED PLANTAIN
**Plantago lanceolata*	ENGLISH PLANTAIN
**Plantago major*	COMMON PLANTAIN
**Plantago virginica*	DWARF PLANTAIN
PLATANACEAE — Plane Tree or Sycamore Family	
Platanus racemosa	WESTERN SYCAMORE
POACEAE — Grass Family	
Achnatherum coronatum	GIANT STIPA
Agrostis diegoensis	LEAFY BENT GRASS
**Avena barbata*	SLENDER WILD OAT
**Avena fatua*	WILD OAT
Bothriochloa barbinodis	CANE BLUESTEM
**Brachypodium distachyon*	PURPLE FALSEBROME
**Bromus carinatus*	CALIFONRIA BROME
**Bromus diandrus*	RIPGUT GRASS
**Bromus hordeaceus*	SOFT CHESS
**Bromus madritensis* ssp. *rubens*	FOXTAIL CHESS, RED BROME
**Cortaderia selloana*	SELLOA PAMPAS GRASS
Distichlis spicata	SALTGRASS
**Ehrharta erecta*	PANIC VELDT GRASS
Elymus spp.	NATIVE WILD RYE
**Gastridium ventricosum*	NIT GRASS
**Hordeum spp.*	BARLEY
**Hordeum marinum*	MEDITERANEAN BARLEY
**Lamarckia aurea*	GOLDEN-TOP
Leymus condensatus	GIANT WILD-RYE
**Lolium multiflorum*	ITALIAN RYEGRASS
Melica frutescens	TALL MELIC
Melica imperfecta	COAST RANGE MELIC
Muhlenbergia microsperma	LITTLE-SEED MUHLY
Nassella lepida	FOOTHILL NEEDLEGRASS
Nassella pulchra	PURPLE NEEDLEGRASS

Family and Latin Name	Common Name
**Paspalum dilatatum*	DALLIS GRASS
Paspalum distichum	COMMON KNOTGRASS
**Pennisetum setaceum*	AFRICAN FOUNTAIN GRASS
**Piptatherum miliaceum*	SMILO GRASS
**Poa annua*	ANNUAL BLUEGRASS
**Polypogon monspeliensis*	ANNUAL BEARD GRASS
**Schismus barbatus*	MEDITERANEAN SCHISMUS
Vulpia microstachys	FESCUE
**Vulpia myuros* var. *myuros*	RAT-TAIL FESCUE
Vulpia octoflora	SLENDER FESCUE
POLEMONIACEAE — Phlox Family	
Gilia angelensis	GRASSLAND GILIA
Gilia ochroleuca	VOLCANIC GILIA
Linanthus dianthiflorus	FARINOSE GROUND PINK
Navarretia hamata	PINCUSHION
POLYGONACEAE — Buckwheat Family	
Chorizanthe fimbriata var. *fimbriata*	FRINGED SPINEFLOWER
Chorizanthe procumbens	PROSTRATE SPINEFLOWER
Chorizanthe staticoides	TURKISH RUGGING
Eriogonum fasciculatum var. *fasciculatum*	COAST CALIFORNIA BUCKWHEAT
Polygonum lapathifolium	WILLOW SMARTWEED
Pterostegia drymarioides	GRANNY'S HAIRNET
**Rumex conglomeratus*	WHORLED DOCK
**Rumex crispus*	CURLY DOCK
POLYPODIACEAE - Polypody Family	
Polypodium californicum	CALIFORNIA POLYPODY
PORTULACACEAE — Purslane Family	
Calandrinia ciliata	RED MAIDS
Calyptridium monandrum	COMMON CALYPTRIDIUM
Claytonia perfoliata ssp. *perfoliata*	MINER'S-LETTUCE
PRIMULACEAE — Primrose Family	
**Anagallis arvensis*	SCARLET PIMPERNEL, POOR MAN'S WEATHERGLASS
Dodecatheon clevelandii ssp. *clevelandii*	PADRE'S SHOOTING STAR
Samolous parviflorus	WATER-PIMPERNEL
PTERIDACEAE — Brake Family	
Adiantum jordanii	CALIFORNIA MAIDENHAIR
Cheilanthes newberryi	CALIFORNIA COTTON FERN
Pentagramma triangularis ssp. viscosa	STICKY SILVERBACK FERN
Pentagramma triangularis	FERN
RANUNCULACEAE — Buttercup Family	

Family and Latin Name	Common Name
Clematis ligusticifolia	YERBA DE CHIVA
Delphinium parryi ssp. *parryi*	PARRY'S LARKSPUR
Thalictrum fendleri var. *polycarpum*	SMOOTH-LEAF MEADOW-RUE
ROSACEAE — Rose Family	
Adenostoma fasciculatum	CHAMISE
Cercocarpus minutiflorus	SAN DIEGO MOUNTAIN-MAHOGANY
Heteromeles arbutifolia	TOYON, CHRISTMAS BERRY
Potentilla glandulosa ssp. *glandulosa*	STICKY CINQUEFOIL
Rosa californica	CALIFORNIA ROSE
Rubus ursinus	CALIFORNIA BLACKBERRY
RHAMNACEAE — Buckthorn Family	
Adolphia californica	SPINESHRUB
Ceanothus tomentosus	RAMONA-LILAC
Ceanothus verrucosus	WART-STEM-LILAC
Rhamnus crocea	SPINY REDBERRY
Rhamnus ilicifolia	HOLLY-LEAF REDBERRY
RUBIACEAE — Madder or Coffee Family	
Galium angustifolium ssp. *angustifolium*	NARROW-LEAF BEDSTRAW
Galium aparine	COMMON BEDSTRAW, GOOSE GRASS
RUTACEAE — Rue or Citrus Family	
Cneoridium dumosum	COAST SPICE BUSH, BUSH-RUE
SALICACEAE — Willow Family	
Salix exigua	SAND BAR WILLOW
Salix gooddingii	GOODDING'S BLACK WILLOW
Salix lasiolepis	ARROYO WILLOW
SAURURACEAE — Lizard's Tail Family	
Anemopsis californica	YERBA MANSA
SAXIFRAGACEAE — Saxifrage Family	
Jepsonia parryi	COAST JEPSONIA
SCROPHULARIACEAE	
Scrophularia californica ssp. *floribunda*	CALIFORNIA BEE PLANT/FIGWORT
SELAGINELLACEAE — Spike-Moss Family	
Selaginella bigelovii	BIGELOW'S SPIKE-MOSS
Selaginella cinerascens	MESA SPIKE-MOSS
SOLANACEAE — Nightshade Family	
Datura wrightii	WESTERN JIMSON WEED
Lycium andersonii	WATERJACKET
**Nicotiana glauca*	TREE TOBACCO
Solanum douglasii	DOUGLAS'S NIGHTSHADE
Solanum parishii	PARISH'S NIGHTSHADE

Family and Latin Name	Common Name
Solanum xantii	NIGHTSHADE
TAMARICACEAE — Tamarisk Family	
**Tamarix* spp.	SALTCEDAR
THEMIDACEAE — Brodiaea Family	
Bloomeria clevelandii	SAN DIEGO GOLDENSTAR
Bloomeria crocea var. *crocea*	COMMON GOLDENSTAR
Brodiaea filifolia	THREAD-LEAF BRODIAEA
Brodiaea orcuttii	ORCUTT'S BRODIAEA
Brodiaea terrestris ssp. *kernensis*	DWARF BRODIAEA
Dichelostemma capitatum ssp. *capitatum*	BLUE DICKS
Muilla maritima	COMMON MUILLA
TYPHACEAE — Cattail Family	
Typha ssp.	CATTAIL
URTICACEAE - Nettle Family	
Parietaria hespera	PELLITORY
Urtica dioica ssp. *holosericea*	HOARY NETTLE
**Urtica urens*	DWARF NETTLE
Hesperocnide tenella	WESTERN NETTLE
VERBENACEAE — Vervain Family	
Verbena lasiostachys	VERVAIN
VIOLACEAE — Violet Family	
Viola pedunculata	JOHNNY JUMP-UP

*Denotes non-native plant species.

The majority of the nomenclature follows the Checklist of the Vascular Plants of San Diego County, 4th Edition, 2006.

by Jon P. Rebman and Michael Simpson

Appendix C - Coastal Sage Scrub Monitoring Plan

The Center for Natural Lands Management-San Diego:
Coastal Sage Scrub Monitoring Plan
(Amended November 2011)

Objective: Track the changes in structure and composition of the coastal sage scrub (CSS) community.

a. Use data to evaluate the structure and composition of the CSS vegetation community and its correlation to predictions of vegetation changes based on theories postulated by ecological and threats models.
b. Use data to evaluate changes or trends in "populations", presence/absence and/or occupied/unoccupied habitat of sensitive animal species, primarily the coastal California gnatcatcher (*Polioptila californica californica*)(CAGN).
c. Use data to evaluate changes in species richness.
d. Use data to evaluate changes over time from a baseline vegetation pattern.
e. Use data to guide vegetation management decisions (i.e. non-native plant removal, rare species range increases/introductions).

Background of Need:

The Center for Natural Lands Management (CNLM) manages several thousand acres of CSS in San Diego County. These areas host many threatened, endangered and sensitive plant and wildlife species, provide for wildlife movement and are some of the last remaining stands of CSS in coastal San Diego. These areas were also specifically designated as important areas to conserve under the regional Habitat Conservation Planning (HCP) conservation efforts.

As a result, the CNLM needs to be able to evaluate recruitment and vigor of this vegetation community over time to guide management decisions and to evaluate changes in plant and animal communities. This monitoring will also provide an opportunity to evaluate theorized predictions of changes in vegetation communities resulting from urbanization, non-native species invasion, global warming, increased edge, altered fire regime and fragmentation (to name a few).

Background of Ecological Model and Threats

CSS is a fire-adapted vegetation community with fires occurring naturally, but most severely under the extreme Santa Ana heat and winds of late summer and fall and during drought conditions. During these conditions there would generally be a "complete burn" where all above ground vegetation within the fire's path would be consumed. After such a fire, herbaceous plants (fire followers), which are known to sprout after fires, would dominate the landscape for a few years. Over time (3-5 years) the shrub lands would regain their dominance, and after 5-10 years a mature assemblage of plants and wildlife would again be found on site (Dallman 1998).

The fire frequency in CSS is as frequent as chaparral due to the volatile oils and resins that occur in CSS plants. The plants, such as white sagebrush (*Saliva apiana*), are able to resprout after a fire or produce many seedlings from the dormant seed bank that lies in the soil. Seed germination of some species may also be stimulated by fire (Holland and Keil 1995, Dallman 1998). However, if the fire frequency and intensity are too great, plants in the CSS community, such as black sage (*Salvia mellifera*) and California sagebrush (*Artemisia californica*) are permanently killed and can no longer regenerate, slowly converting the CSS community to a non-native, annual grassland (Southwest Division, Naval Facilities Engineering Command 1998).

Each CNLM preserve in San Diego has a different fire history and a different predicted fire future. For example, most of the Rancho La Costa (RLC) Habitat Conservation Area (HCA) burned in the Harmony Grove fire in October of 1996, while the Manchester HCA has not burned (except two very small fires) in its entirety since 1917. Prior to 1917 no data are recorded, so it is uncertain as to when the last significant fire event occurred in the Manchester HCA.

Regardless of fire history and the current vegetation characteristics, there are many realized or potential threats to the integrity of the CSS vegetation community (See RLC Habitat Management Plan CSS Ecological Model and Threats Section (CNLM 2005) that need to be evaluated including:

1. What is the effect of an altered fire regime at each HCA?
2. What is the potential effect of global climate change?
3. What are the effects of urban edge?
4. What are the effects of fragmentation and isolation?
5. What are the effects of altered wildlife usage patterns?

The answers to these threats questions lead to other questions that are associated with effects on ecological processes and patterns, such as:

1. Are the variables investigated representing a threat?
2. At what spatial scale are the variables representing a threat?
3. How do the effects of the threats listed above effect the distribution and abundance of sensitive plant and wildlife species?
4. How do the threats listed above effect the distribution of non-sensitive plants and animals?
5. How do the effects of each threat alter ecological processes?
6. How do the various measured factors interact?

Predictions

Fire. We predict that as a result of fragmentation, complete burns of preserves are now less likely and that there will be fewer, smaller fires resulting in a mosaic of CSS with various age structures.

Global Climate Change. We predict that rainfall patterns will change (likely decrease) over the next 100 years resulting in a lengthening of the fire season, increased frequency of lightening fires, increased frequency of drought, and areas burned. We predict:

1. Possible regime shifts (altered abundance and recruitment patterns in various native vegetation assemblages)
2. Altered invasion severity of exotic species due to changes from native-adapted variations in weather phenomena
3. Lowered native seedling survival of species due to changes from native-adapted variations in weather phenomena
4. Lowered seed and/or clonal production of future generations due to changes from native-adapted variations in weather phenomena
5. Negative interactions between native wildlife and changes resulting from the above mentioned predictions in vegetative cover

Habitat Fragmentation and Urban Edge. We predict that habitat fragmentation will reduce plant diversity and migration and/or genetic exchange between plant populations. This could affect the CSS community by reducing vigor within populations and eventually leading to extinctions of specific plant species.. Habitat fragmentation has resulted in an increase of urban edge on all our preserves. We predict that this will result in increased pressures from non-native plant species, illegal vegetation clearing, dumping, erosion, and other threats that will change the vegetation structure and composition.

Monitoring Methodology

Approximately fifty plots will be established inside three of our preserves, and the number per preserve allocated by the amount of acreage currently occupied by CSS in each preserve. These plots will be placed in a stratified random manner across our preserves. Stratification will take into account:

1. Size of preserve
2. Slope and aspect
3. Distance from preserve edge/urban edge

4. Presence or absence of CAGN or San Diego horned lizard (*Phrynosoma coronatum blainvillii*)
5. Fire history

Plot Design and Setup

The original plot design was based on the Whittaker nested vegetation sampling design as in Stohlgren et al. 1995. The design of the Whittaker nested vegetation sampling plot deviated from that described in Stohlgren et al. 1995 by not including the 12 smaller 1-square meter rectangles. The dimensions of the modified Whittaker nested vegetation sampling Plot was 50 meters long by 20 meters wide. Three smaller nested plots were placed inside the sampling Plot, the largest of these three was 20 meters long and 5 meters wide, placed in the center of the sampling Plot, with the long axis corresponding to that of the Plot. The two other nested plots were at opposite corners of the sampling Plot, and were 5 by 2 meters in length, again with the long axis corresponding to that of the sampling Plot. The long axis of the modified Whittaker plots were set to cross the environmental gradient present at the sampling Plot location. Sampling was carried out for both continuous variables (percent cover by species) and non-parametric and semi-continuous variables (count of dead shrubs, species richness).

The sampling Plot design was modified in 2011 after data analyses revealed that less area could be sampled within each Plot. The two, 5 by 2 meter nested plots were deleted from the sampling effort and the 5 by 20 meter center, nested plot was reduced in size to 2 by 20 meters.

Point Intercept Data (Percent Cover)

Percent cover by species was gathered by running a metric measuring tape along the upper border of each Plot. The point-intercept transects were standardized to read hits at half meter intervals, thus generating 99 "hits" along the long (50 meter) side of the Plot. Living plants were counted as a point or "hit," if a 1.5 millimeter dowel is intersected in the vertical plane by the living tissue of a plant. At each half meter, data pertaining to bare ground, rock, or litter incident with the dowel was also collected. Dead branches attached to a living shrub do not count as a "hit." If a completely dead shrub is incident to the dowel along the point intercept line, that shrub is noted by species (if possible) in a separate column from the living plant "hits." The hope is that this may generate information pertaining to large-scale shrub die-off, as has been recently noticed, but had gone quantitatively undocumented in the Rancho La Costa HCA.

The point-intercept transect measures will provide a method of quantifying change in abundance by species and edaphic cover that may also tie into species richness changes observed within the center, sub-plot. For instance, non-native grasses and/or litter cover changes may be predictive as explanatory variables in a multi-factorial analysis of the response variables mortality or species decline. Other variables that may be tied into a model explaining the measured pattern may include regional rainfall totals for the season and/or seasonal temperature averages, slope and aspect of Plots, fire history, and the presence or absence of animal herbivory.

Species Richness

Species richness was originally gathered inside the three, nested subplots located inside each Plot; however, as discussed above, in 2011, species richness was only collected in the nested center plot that was reduced in size from 5 by 20 meters to 2 by 20 meters. Each species occurring within the center plot was recorded. Plants were identified to species and subspecies whenever possible.

The data collected in the center plot will be useful in generating species area curves and (more importantly) in documenting species presence or absence, as well as recruitment and mortality over time.

We obtained shrub counts in our nested subplots and in the Plot during our first year of sampling (N = 17 Plots), and found that any counting inside subplots and the Plot, in addition to noting species richness cannot be supported on our HCA endowments. Collecting species richness in these subplots is the most time-consuming portion of each visit.

Sampling intensity

CNLM met with Dr. Douglas Deutschman at San Diego State University to inquire into methods of maximizing our return from our effort. We could not afford to monitor more than approximately 20 Plots per year. Also, the effects of trampling could mislead our conclusions about trend over time if we re-visited the same sites every year over the course of many years. It is necessary to capture the yearly variation in conditions such as rainfall and temperature, and thus we knew that many replicates would be needed in order to capture meaningful patterns.

Dr. Deutschman suggested a "rotating panel" approach. This approach incorporates visiting a subsample of all Plots on a yearly basis, ensuring to balance the replicates according to aspect and to spread these replicates across the landscape in order to capture variation in weather or rainfall that may take place across our sample region. It was suggested that we re-visit eight Plots over the course of three years, while rotating 12 or more new Plots over the course of the three years. Thus, after the third year of sampling, 45 plots have been visited, and the variation in measures among the eight re-visit Plots can be compared to the rotating Plots. In this manner we can judge if yearly re-visits are necessary in the long-term, or if more sites are needed each year.

For instance, one potential outcome is that the region in which we are sampling does not vary substantially in factors influenced by weather or disturbance, and that by stratifying sub-sampling across the region and visiting a subsample of the whole, we can adequately capture the variation in vegetative and species richness measures without overtaxing our annual budgets. Another potential outcome is that we will obtain substantial information from this rotating panel design to indicate how many more sites should be visited on a yearly basis to capture the yearly variation without visiting the entirety of our plots.

Analyses and sample size

CNLM again met with Dr. Deutschman in late 2011 to review data gathered over the course of the three consecutive years since collection began in 2009. Another meeting is scheduled for early December 2011 as of this writing. The considerations under his cognizance are how many Plots are needed in order to gain *X* percent certainty that *X* change in particular vegetation functional group cover (exotic forbs, exotic grasses, etc.) is occurring while maintaining affordability of sampling effort. This is at face value a sliding scale scenario whereby the most sensitive measures (non-native grasses and native forbs) determine how precise our estimates should be, and affordability also helps determine the precision of both the percent change that is meaningful and the desired precision. The second meeting in December 2011 should help us further refine the most desirable yearly sample size for these most sensitive response variables. Based on power analyses based on the t statistics generated in the paired t tests, for the repeat plots that were performed for three consecutive years, it would appear that a minimum of 12 separate plots will need sampling every year, on a three or four year return interval. We are unsure at the moment how many to visit yearly, but will know soon. Table 1 below contains some basic statistics of a combination of the yearly repeat visit plots and the rotating plots also read, and thus totals to 60 plots altogether. Note that the variability of both exotic forbs and native grass cover relative to the other categories (the basic utility of the coefficient of variation) is much higher.

Table 1. Summary statistics for all plots 2009-2011, including repeat plots.

	Exotic forb	Exotic grass	Native forb	Native grass	Native shrub
N of Cases	60	60	60	60	60
Minimum	0	0	0	0	4
Maximum	42	62	56	29	87
Arithmetic Mean	6.767	12.7	9.75	4.4	45.567
Standard Deviation	11.115	12.163	10.042	6.559	19.793
Coefficient of Variation	1.643	0.958	1.03	1.491	0.434
Effect 20% of Mean	1.3534	2.54	1.95	0.88	9.1134

The basis for comparison in rotating sampling plots is necessarily a paired design whereby each unit gets compared to itself upon reaching the second return sampling event and thenceforth with every subsequent return. Each shape and corresponding color in Figure 1 below refers to a set of plots where data are collected on a given year. The paired comparisons will take place between years; since variation in the measures performed thus far indicate that spatial variability among plots is much greater than year-to-year variability among plots. To put it another way, plots are very dissimilar to one-another in cover and representation of this cover by shrubs, grasses, and forbs, and these measures don't change as much year-to-year as they do differ from one-another from site to site.

Figure 1. Rotating css plot analysis diagram. Each symbol represents a set of plots measured in a given year, repeating at regular intervals and analyzed using paired repeat measures methodology.

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Appendix D - 2010 Progress report for the herbicide application of Fusilade II to thread-leaf brodiaea (*Brodiaea filifolia)*

Appendix E - San Diego Thornmint Habitat Assessment Methodology

San Diego Thornmint Percent Cover and Diversity Estimation Procedures

Center for Natural Lands Management
Patrick McConnell and Jessica Vinje
December 2009

This method is to be used to estimate the percent cover and diversity in habitat occupied by San Diego thornmint (*Acanthomintha ilicifolia*) in areas where the San Diego thornmint population has already been located and mapped and is actively being monitored by the land manager or owner. This method was shown to be very precise at estimating both percent cover and diversity for an area that was 42 square meters (6 meters x 7 meters) and occupied by San Diego thornmint. Six quadrats (dimensions explained below) were placed in the 42 square meter area and percent cover and diversity were collected in each randomly placed quadrat (see methods below). This method cannot be used to estimate San Diego thornmint population numbers (i.e., density).

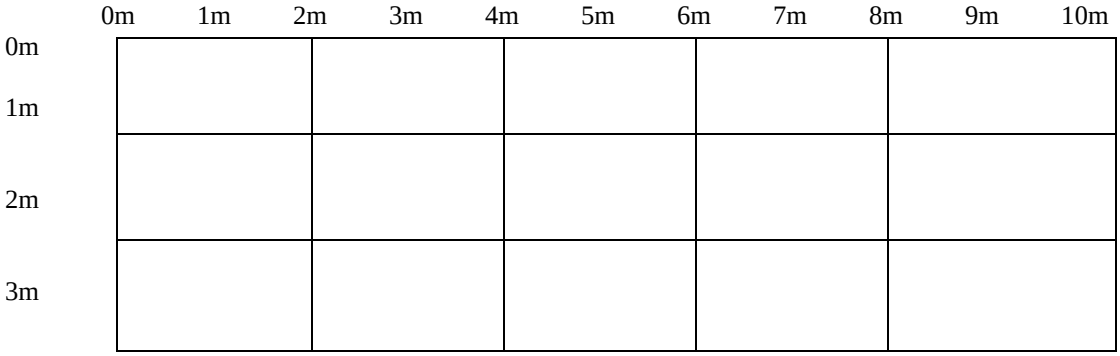
Field Equipment

- Quadrat (construction and dimensions discussed below)
- Two, 50 or 100-meter tape measures
- Survey field form and pen, or palm top device with pocket excel
- Random number table
- Field plant press
- At least four pieces of Rebar (to delineate the population boundaries)

1. Macroplot Establishment

First create a macroplot around the entire San Diego thornmint population. To do this, place a rectangle (or square) using a meter or foot tape measure (i.e., nylon, steel, or fiberglass) around the population by creating four corners, ensuring that the entirety of the population is included within the rectangle, and ensuring that the tape length and width are evenly measured to ensure no decimal lengths or widths. Each side should be whole meter (or foot) dimensions, such that the rectangle or square can be easily subdivided.

Measure the length and width of the rectangle and plot these dimensions on paper. Further divide the plotted rectangle or square into even dimensions. For instance, if your population is bounded by a rectangle 3 meters wide by 10 meters long, the following may be advised:



1a. Point Intercept Quadrats to Collect Percent Cover

Once the macroplot has been established, create the quadrats that will be placed inside the macroplot to collect the percent cover data (photograph 1). The dimensions of the quadrat we recommend is ½ meter by 1 meter. For easy construction of the quadrat, you may choose small diameter pvc pipe, four pvc elbows to fit the pipe together into a rectangle, and some thin steel wire. All of these items can be purchased at Home Depot. Regular placement of intercepting wire can be obtained by weaving the wire through at 1 decimeter intervals. The 1 decimeter intervals can be premeasured and then drilled into the pvc pipe prior to construction of the rectangular quadrat. The elbows need not be glued, as the frame holds well if there is little slack in the wire. Once the rectangular quadrat is constructed and the wire has been attached, the result will be 36 points from which to gather cover in each quadrat. Each point is the intersection of the steel wires. The intersection of each wire at 1 decimeter squares is a useful method of estimating cover for small areas.

Photograph 1: Rectangular quadrat constructed from pvc pipe with the steel wire evenly placed to create 36 points (points correspond to intersection of steel wire)

Percent cover by plant species, bare ground and litter can be estimated by placing the quadrat along either evenly placed intervals, or by stratified random placement, along even meter intervals in the macroplot. The choice between stratified random placement or subjective placement depends on the objectives or uncertainties surrounding the objectives of the manager. If one does not expect to carry out habitat enhancement experiments or studies of the like, then there is no need for randomization. Randomization, however, can remove uncertainty in placement, and allow for a more objective window into the estimate of cover by species from year to year. To think about this another way: from year to year, there may be shifts in exotic cover, or invasion of an exotic into one area of the macroplot that would not be assessed if one re-visits the same quadrat locations each year. Additionally, re-visiting the same exact locations yearly leads to cumulative trampling issues, and thus, you may consider re-randomizing every year to avoid this pitfall. Stratified random placement removes these difficult decisions, and simultaneously allows for fairly even placement of the quadrats. One can also generate confidence intervals, and report standard errors in tables and/or graphics if quadrat locations are chosen randomly.

If the *example* population (discussed above in Section 1) is to be subdivided, five quadrats would be adequate for stratified random placement. Or, for a population CNLM sampled, which was 42 square meters, six quadrats were randomly placed within the population (i.e., for every 7 square meters, one, ½ x 1-meter rectangular quadrat was randomly placed and data collected within that quadrat). The randomization would most easily be accomplished by using a random number table, and choosing any number from zero through six, for the example population discussed in Section 1, at 1/2- meter sections for rows, and flipping a coin for whether the plot shall rest between zero and one meter, or one and two meters for each 2 meter column section. Theory suggests the long axis of the quadrat should always run opposite the direction of the slope, if there is a slope. Figure 1 below suggests five quadrats are adequate for gathering precise cover estimates. CNLM obtained very precise percent cover estimates by sampling roughly seven percent of the total area of a population in Carlsbad. If you are required to determine the number of quadrats necessary to achieve precise estimates, an easy method is to first gather the amount of quadrats you think is adequate, and plot cover sequentially.

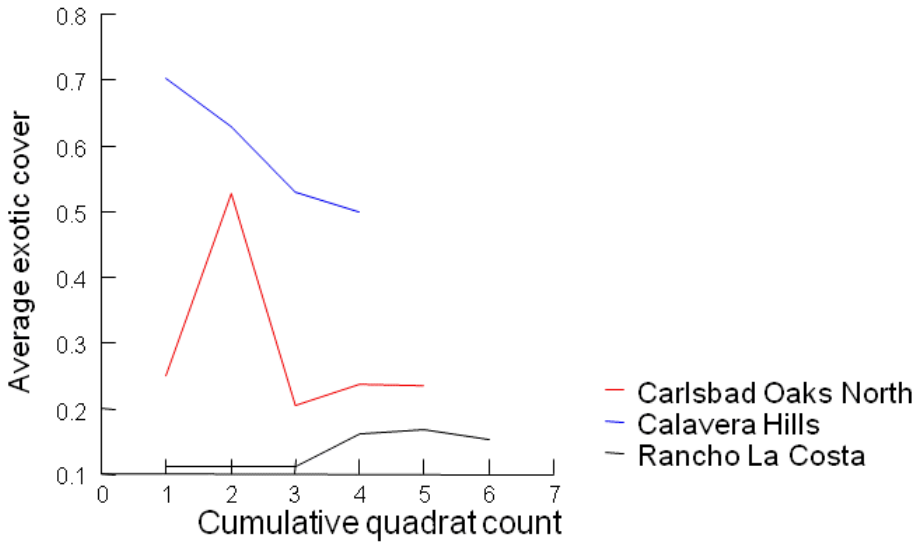


Figure 1. Fluctuations in average decimal percent cover as a response to increasing quadrat numbers among three San Diego thornmint populations in Carlsbad that CNLM manages and monitors on an annual basis. *Note that fluctuations tend to level out as quadrat count increases to four.*

Once the location for each quadrat is determined using the random number table, additional tape measures can be used to pin point the exact quadrat location within the macroplot. Once the quadrat is placed in the correct location, data can be collected. At each intersecting point within the quadrat, the observer will record the species that is directly "hit" underneath the intersecting wires. More than one species can be recorded if more than one species is "hit" underneath the point of the intersecting wires. Additionally, either litter or bare ground is also recorded. So, for each point or "hit" the recorder will record either litter or bare ground and, if a plant species or more than one plant species is also present underneath the point, then the species will be recorded as well. Data are collected until all points (36 points) have been assessed. This process is repeated for each quadrat that is placed within the macroplot.

1b. Species Diversity

Species diversity can indicate the arrival or increase in area coverage of species, and is an important variable to collect while collecting percent cover. The observer can simply record all species present in each quadrat while collecting percent cover data in the quadrats that are randomly placed in the macroplot (as discussed above). However, if the observer wants to determine the number of quadrats needed for collecting only species diversity then the following method can be used. The number of quadrats needed for adequate estimation of species diversity can be empirically determined by plotting the cumulative species diversity found within each quadrat against the number of quadrats (as in Figure 1). If, for instance you see no further increase in cumulative species number between four and five plots, then you may rest assured that you have enough plots to capture what is happening among species from year to year. There is no need to determine this if intuition and/or experience tells you that there isn't very much heterogeneity, or you determine that you want to limit your disturbance of the clay lens by limiting the number of quadrats.

Appendix F - San Diego Thornmint Abstract

Center for Natural Lands Management

Plant Abstract Reference: Bot001
Draft v1c: June 13, 2011

San Diego thornmint

Acanthomintha ilicifolia

Prepared by: Deborah L. Rogers
Reviewed and revised by: Markus Spiegelberg, Patrick McConnell, Jessie Vinje

Taxonomic description: San Diego thornmint is an annual aromatic herb in the Lamiaceae (mint family). The Lamiaceae is a large, cosmopolitan family with over 240 genera. There are four species in the genus *Acanthomintha*, all of them in the California Floristic Province (Jokerst 1993).

Conservation status: Global Status: G1 - Critically Imperiled
(US) Federally threatened (1998) – 63 FR 54937
(California) State endangered (1982)
California Native Plant Society: List 1B.1 (rare throughout range and seriously threatened)
Covered in the following Habitat Conservation Plans (HCPs)*:
Fieldstone/La Costa & City of Carlsbad MSVP
City of Carlsbad HCP MSCP
City of Chula Vista Subarea Plan MSCP
City of La Mesa Subarea Plan MSCP
City of Poway Subarea Plan
City of Encinitas Subarea Plan MHCP
City of Oceanside Subarea Plan MHCP
City of San Marcos Subarea Plan MHCP
City of Escondido Subarea Plan MHCP
City of San Diego Subarea Plan MSCP
San Diego County MSCP
(*Not all plans have been executed yet via Implementing Agreements)

Distribution

Rangewide

Acanthomintha ilicifolia is known from 80 historical and 55 extant occurrences in coastal San Diego County, California, and 13 (within unknown status) occurrences in Baja California Norte, Mexico (Sierra Juarez and coastal) (USFWS 2009). The known extant occurrences in San Diego County range from the City of Oceanside in the north, to Ramona in the east, to Jamul in the southeast (see Figure 1). These occurrences range in elevation from sea level to 3,000 ft. (USFWS GIS analysis 2009). Approximately 70 percent of extant occurrences are currently protected from development (USFWS 2009).

The extant number of occurrences remains somewhat uncertain—both because of possible recent extirpations as well as the cryptic nature of some (especially small) occurrences. Although a comprehensive range-wide survey has not been conducted, limited surveys in the early 1990s (Bauder et al. 1994) and in 2010 (by the San Diego Thornmint Working Group initiated by CNLM, USFWS, and CDFG) revisited and confirmed 21 and 33 (out of 37) occurrences, respectively (i.e., not all 55 occurrences were revisited during either survey). It is not known whether the four occurrences not confirmed in 2010 are extirpated or were simply not apparent that year.

CNLM

This species occurs on three CNLM preserves: Manchester Habitat Conservation Area (S006), La Costa Habitat Conservation Area (S020), and Carlsbad Oaks North (S034) Preserves.

Reproductive biology: Plants in this genus are winter annuals: germinating in the winter rainy period, flowering in late spring, setting seed and dying in early summer. Reproductive output is affected by environmental conditions which somewhat determine number of branches, nodes per branch, and flowers per node. Seeds per flower, however, are fixed at a maximum of four. The breeding and mating systems of San Diego thornmint are unknown but study of other congeneric species indicate some level of self-compatibility and autogamous seed production (Steeck 1995). Insect visitation has been investigated for other congeneric species, with medium- and large-sized bees, particularly bumble bees, being noted as the most common visitors (Steeck 1995). For A. ilicifolia, insect visitation has been observed that may indicate a role in insect pollination although this has not been confirmed and no species-specific pollinators have been identified (Bauder and Sakrison 1997). However, a study of potential pollinators provided observations of insects < 6 mm landing on and entering San Diego thornmint flowers, with larger insects seemingly unable to enter the flowers (Klein 2009). That study further suggested that excessive ground thatch may interfere with insect visitation and also nesting of potential pollinators such as ground-nesting bees.

Much of the seed may be stored above-ground (and little in soil seed banks) in the dried calyces and may not be long-lived (Bauder and Sakrison 1999). A soil seed bank study, drawing samples from a Goodan Ranch/Sycamore Canyon population, revealed high variability in the concentration of seed in the soil between sites and among sampling dates. Germination rate of soil bank seed was generally low, except for the fall (October) collection date (Bauder and Sakrison 1999). A study of germination conditions indicated that optimal conditions for germination include a long daily cool period (~ 10 °C.) and that germination may be inhibited by warm temperatures (Bauder and Sakrison 1997). The relationship between seed germination and storage time has not been investigated. However, there is some evidence that, at least initially, there is a positive relationship between seed age and germinability (Bauder and Sakrison 1997). Preliminary observations from CNLM monitoring suggests a relationship between (total) annual precipitation and number of plants.

Life form: Annual herb.

Fire ecology: Largely unknown. In principle, fire may negatively impact natural regeneration through destruction of above-ground (and possibly also soil-) seed bank. However, depending on weed competition and timing of fire, fire may also enhance conditions for *A. ilicifolia* by reducing non-native vegetative competition. The specific effect of fire may be quite site-specific: depending on the nature of the competing vegetation (its response to fire relative to that of San Diego thornmint) and the specific fire characteristics (intensity, coverage, duration). For example, it has been observed that fire may have also opened up occupied thornmint habitat to the invasion of non-native, annual grass species (specifically purple false-brome, *Brachypodium distachyon*), which has possibly greatly reduced at least one thornmint occurrence (CBI 2010). It has been documented that A. *ilicifolia* can re-establish after fire (Sclafani 2005, CBI 2010). Occurrences on Viejas Mountain experienced high-severity fire in 2003. Thornmint response is unknown. At least one species management plan (USDA Forest Service) recommends allowing wildland and prescribed fires to burn freely in areas where San Diego thornmint occurs ((Winter 1991).

Genetic description:

Genetic structure: Not available (NA)
Genetic diversity: NA
Transmission genetics: NA
Cellular: NA. Note that many species in this family—with examples from *Thymus*, *Glechoma*, *Pycnanthemum*, *Salvia*, and *Mentha*—are polyploid, providing reasonable possibility that this species, also, may be a polyploid.

Ecology: Evidence of insect visitation but their relationship with pollination and fertilization is unknown. The species is found in association with California chaparral, coastal sage scrub, and annual grassland habitats. It is further restricted to heavy clay soils (derived from gabbro and soft calcareous sandstone substrates with a loose, crumbly structure and fissures approximately one to two feet deep), gentle slopes (ranging from 0 to 25 degrees), and with open structure (low density of forbs and geophytes and low density or absence of shrubs) (Oberbauer 1993, USFWS 2008).

Possible threats to California populations include:

- Lack of information concerning relationship with potential pollinators

- Lack of information concerning natural seed source (soil vs above-ground) and longevity of seed above-ground, soil seedbank, and in controlled storage
- Lack of information concerning amount and distribution of genetic variation; mating system; and relative viability of selfed vs outcrossed seeds
- Lack of information concerning local adaptation (including adaptive genetic diversity and ploidy determination)
- Lack of information concerning effective translocation practices (For example, of seven known translocation attempts (of five occurrences), five have failed (USFWS 2009)). Similar difficulties have been experienced in attempts to establish new populations of congeneric and similarly threatened species (Pavlik and Espeland 1998)
- Loss of suitable (although 'protected') habitat because of lack of financial resources or management-related species information
- Competition with non-native exotic plant species (e.g., Bauder and Sakrison 1999, USFWS 2009) such as purple false-brome

CNLM Management implications:

- Management of vegetative competition is important: attention to avoiding negative impact on potential pollinators
- Stochastic events (e.g., several unfavorable reproductive years or certain fire events) could threaten viability of existing occurrences, especially those small in size
- Translocation attempts may be high risk
- High failure rate in translocation attempts, and the lack of genetic information, suggests caution in any seed movement among occurrences.
- Small occurrences could be further at risk due to loss of pollinators or inbreeding depression—neither of which has been investigated.

Management considerations:

1. Is it important to rapidly expand existing populations (especially small populations)? Reasons could include:
    a. Evidence that there is inadequate natural recruitment
    b. Recent fragmentation of once-continuous or larger populations
    c. Loss or potential loss of habitat as a result of competition from exotic invasives
2. Is sexual reproduction limiting?
    a. Evidence of inbreeding depression?
    b. Loss of specialist (or generalist) pollinators?
    c. Inadequate (or too vulnerable) soil or above-ground seed bank?
3. How is fire disturbance most likely to affect thornmint survival and reproduction? What, if any, management actions should be taken towards allowing or moderating wildland fires?

Management actions:

1. Monitor existing *A. ilicifolia* occurrences at a temporal and spatial scale that will allow detection of any trend towards extirpation.
2. Develop fire plans (or revise existing fuel management plans or five-year management plans) for CNLM preserves on which there is an occurrence of *A. ilicifolia*. Communicate to and discuss these plans with the local fire agencies.
3. Develop information on patterns of genetic variation among populations (genetic structure), including information on genetic variation in some adaptive traits so as to inform decisions regarding artificial propagation/restoration and any translocation events. Develop plan and grant proposal and/or work with collaborators.
4. Investigate or encourage the investigation among collaborators insect pollination and fertilization of this species.

5. Investigate or encourage the investigation of inbreeding depression.
6. Investigate or encourage the investigation of shelf-life (i.e., effects on germination) of seed stored in *ex situ* conditions.
7. Depending on results of Management Action #6, conduct seed collections during good seed years, using collection guidelines that are to be developed following information gained from Management Action #3.

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Figure 1. Status and distribution of *Acanthomintha ilicifolia* 2009 (USFWS 2009).

Abstracts from key literature:

Title: Demography of natural and reintroduced populations of Acanthomintha duttonii, an endangered serpentinite annual in northern California
Authors: Pavlik, B.M. and E.K. Espeland.
Source: Madroño 45 (1) 31-39, 1998
Abstract: The purpose of this study was to 1) demographically monitor the only remaining natural population of the rare serpentinite annual plant *Acanthomintha duttonii* (Lamiaceae); 2) attempt to reintroduce a new, experimental population within historic range; and 3) evaluate the new population by comparing its demographic characteristics with those of the natural population. The natural population of A. duttonii at Edgewood Park significantly and progressively increased in abundance and density between 1990 and 1994, then began a decline that lasted through 1997. In general, high density and high yield (reproductive plants produced from previous year's nutlet production) were associated with average or below-average years of precipitation while low densities and yields were associated with above-average rainfall years. During the entire study period, survivorship to reproduction remained fairly high and consistent, indicating that population trends were due to variations in nutlet production and the influence of cryptic factors that operate in the seed bank. The experimental population at Pulgas Ridge differed in several critical respects from the natural population, including low germination, low and variable survivorship, low nutlet production and perhaps high nutlet mortality. These features reduced the potential for self-sustained growth in the experimental population, which is likely to be extirpated within the next few years. This failure to produce a self-sustaining population of A. duttonii emphasizes the urgent need for in situ preservation of self-sustaining natural populations of serpentinite species.

Appendix G - CNPS Releve Form

CNPS and CDFG Combined Vegetation Rapid Assessment and Relevé Field Form

Relevé or Rapid Assessment (Circle One) (Revised Sept 10, 2009)

For Office Use:	**Final database #:**	**Final vegetation type name:**	**Alliance_____ Association**

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

Polygon/Stand #:	**Air photo:**	**Date:**	**Name(s) of surveyors (circle recorder):**

GPS wypt #: _____ GPS name: _____ Datum: _____ or NAD83. Bearing, left axis at SW pt_____ (degrees) of Long / Short side

UTME ___ ___ ___ ___ ___ ___ **UTMN** ___ ___ ___ ___ ___ ___ ___ **Zone: 10 / 11** (circle one) **Error: ±_____ ft / m / pdop**

GPS within stand? Yes / No If No, cite from waypoint to stand, distance _____(meters) & bearing _____(degrees)

Elevation: **ft / m Camera Name/Photograph #'s**:

Stand Size (acres): <1, 1-5, >5 | Plot Size (m^2): 10 / 100 / 400 / 1000 | Plot Shape ___ x___ ft / m or Circle Radius____ft / m

Exposure, Actual °: _____ NE NW SE SW Flat Variable /All | Steepness, Actual °: _____ 0° 1-5° 5-25° > 25°

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave undulating

Geology code: _____ Soil Texture code: _____ | Upland or **Wetland/Riparian** (circle one)

% Surface cover

H20:____ BA Stems:____ Litter: ____ Bedrock:____ Boulder:____ Stone:____ Cobble: _____ Gravel:____ Fines:_____ =100%
(Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

% Current year bioturbation _____ Past bioturbation present? Y / N | % Hoof punch _____

Site history, stand age, comments:

Type/ Level of disturbance codes: ____/____ ____/____ ____/____ ____/____ ____/____ "Other"

II. HABITAT AND VEGETATION DESCRIPTION

Tree DBH : T1 (<1" dbh), **T2** (1-6" dbh), **T3** (6-11" dbh), **T4** (11-24" dbh), **T5** (>24" dbh), **T6** multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), **S2** young (<1% dead), **S3** mature (1-25% dead), **S4** decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), **H2** (>12" ht.) **% Non-Vasc cover: _____ Total % Vasc Veg cover:_____**

% Cover -Overstory Tree Conifer/Hardwood: _____/_____ Low-Medium Tree: _____ Shrub: _____ Herbaceous: _____

Height Class - Overstory Conifer/Hardwood: _____/_____ Low-Medium Tree: _____ Shrub: _____ Herbaceous: _____

Height classes: 01=<1/2m 02=1/2-1m 03=1-2m 04=2-5m 05=5-10m 06=10-15m 07=15-20m 08=20-35m 09=35-50m 10=>50m

Species, Stratum, and % cover. Stratum categories: T= Overstory tree, U= Understory Tree, S = Shrub, H= Herb, N= Non-vascular.
% cover intervals for reference: <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, 75%.

Strata	Species	% cover	C	Strata	Species	% cover	C

Unusual species: _____

III. INTERPRETATION OF STAND

Field-assessed vegetation alliance name: _____

Field-assessed association name (optional): _____

Adjacent alliances: _____

Confidence in alliance identification: L M H Explain: _____

Phenology (E,P,L): Herb____ Shrub____ Tree____ Other identification or mapping information:

CNPS and CDFG Combined Vegetation Rapid Assessment and Relevé Field Form

RELEVE SPECIES SHEET (Revised 9/10/09)

Page _______ of Polygon/Stand #: ____________

Stratum categories: T = Overstory tree, U = Understory tree, S = Shrub, H = Herb, and N=Non-vascular

% Cover Intervals for reference: <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Strata	Vascular plant name or lichen/bryophyte	% Cover	Collection	Final species determination

Appendix H - Zero Tolerance Plant Species

Zero Tolerance Plant Species

Species	Common name
Acacia spp.	
Ailanthus altissima	Tree of heaven
Asphodelus fistulosus	Onion weed
Brassica tournefortii	Sahara mustard
Carpobrotus spp.	Iceplant
Carrichtera annua	Ward's weed
Centaurea solstitialis	Yellow star thistle
Chasmanthe floribunda	African corn flag
Cirsium vulgare	Bull thistle
Conium maculatum	Poison hemlock
Cortaderia spp.	Pampas grass
Cynara cardunculus	Artichoke thistle
Cytisus scoparius; C. striatus	Scotch and Portuguese brooms
Delairea odorata	Cape ivy
Dipsacus sativas	Fuller's teasel
Dittrichia graveolens	Stinkwort
Echium candicans	Pride-of-Madeira
Ehrharta calycina; E. erecta; E. longiflora	Veldt grasses
Ficus carica	Edible fig
Foeniculum vulgare	Fennel
Fraxinus uhdei	Shamal ash
Genista monspessulana	French broom
Glebionis coronaria	Crown marigold
Hedera helix	English ivy
Lepidium latifolium; L. draba	Pepperweed
Limonium ramosissimum	Algerian sea lavender
Melenis repens	Natal grass
Myoporum laetum	Myoporum
Nicotiana glauca	Tree tobacco
Osteospermum spp.	African daisy
Oxalis pes-caprae	Bermuda buttercup
Pennisetum setaceum	Fountain grass
Piptatherum miliaceum	Smilograss
Phalaris aquatica	Harding grass
Phalaris paradoxa	Paradox canary grass
Phoenix canariensis	Canary Island date palm
Ricinis communis	Castor bean
Rubus armeniacus	Himalaya blackberry
Schinus molle; S. terrebinthifolius	California and Brazilian pepper trees
Senecio linearifolius var. linearifolius	Fireweed
Silybum marianum	Blessed milk thistle
Sorghum halepense	Johnson grass
Spartium junceum	Spanish broom
Tamarix spp.	Tamarisk
Vinca major	Periwinkle
Washingtonia robusta	Mexican fan palm
Yucca gloriosa	Spanish dagger
Zantedeschia sp.	Cala lily

Appendix I - Qualifications

Jessica Sage Vinje

Preserve Manager (Biologist)
Employment history

2006 – Present	The Center for Natural Lands Management, Preserve Manager, San Diego, CA
2001 - 2005	AMEC Earth & Environmental, Botanist/Project Manager, San Diego, CA
January 2005- 2007	San Diego State University Research Foundation, Lead Botanist, San Diego, CA
1998 - 2001	Bureau of Land Management, Natural Resources Specialist/Botanist, Barstow, CA

Professional summary
Ms. Vinje is a biologist with 13 years' professional experience in field biology and land management throughout California with a strong background in natural resource management, and coastal and desert ecology, botany, coastal restoration. She has experience with a wide range of laws including National Environmental Policy Act (NEPA), California Environmental Quality Act (CEQA), State and Federal Endangered Species Acts, and Natural Community Conservation Planning Act. Ms. Vinje has acquired vegetation management/monitoring techniques and possesses extensive botanical survey skills. She is particularly knowledgeable of the Western and Central Mojave Desert, Southern California Coast, Central and Southern California Coastal Ranges, and Central and Southern Sierra Nevada Mountain Ranges where she has surveyed for and located more than 100 threatened, endangered, or sensitive California plant species. Ms. Vinje also possesses restoration ecology skills including implementing, monitoring, and maintaining restoration and mitigation projects in southern California upland and riparian vegetation communities.

Professional Qualifications/Permits
Qualified to apply herbicides
2007, United States Fish and Wildlife Service Least Bell's Vireo Section 10(a) 1(a) Incidental Take Permit (Qualified to nest monitor least Bell's vireo)
2005, United States Fish and Wildlife Service Coastal California Gnatcatcher Section 10(a) 1(a) Incidental Take Permit (Qualified to survey for California Gnatcatchers)
1998 – present, Qualified Desert Tortoise Monitor (BLM)

Professional Training
2007 – Property Analysis Record (PAR) Training
1998-2009 Multiple Sensitive Plant and Vegetation Monitoring Workshops
2005, California Grass Identification Class
2005, Sensitive Butterfly Workshop
2004, Environmental Law and Policy Class
2004, Federal Wetland Law and Regulation Training (Section 404 and Section 10 of the Clean Water Act)
2003, Federal Wetland Delineation Training
2002, Invasive Plant School
2001, Workshop on Assessing the Indicators of Rangeland Health
2001, Workshop on Assessing the Hydrologic Functioning of Riparian Areas and Proper Functioning Condition
2000, Workshop on Measuring and Monitoring Vegetative Communities
2000, Workshop on Desert Tortoise Council Report Writing, Survey Techniques, and Handling Procedures
1999, Soil Survey Workshop
1999, ArcView Certificate
1998 - 2001, Basic 32 Fire Training and refresher training (Arduous rating)
1998 - 2001, Resource Advisor Training
2001 – 2005, OSHA Hazardous Waste Operations and Emergency Response Training (Section 1910.120)

Competitive Grants and Contracts Received
2009. Restoration of Coastal Sage Scrub Habitat on the Whelan Ranch Habitat Conservation Area. Awarded by the Natural Resources Conservation Services - Wildlife Habitat Incentives Program (WHIP), $50,000.00

2009. Restoration of Coastal Sage Scrub Habitat on the Whelan Ranch Habitat Conservation Area. Awarded by the Partners for Fish and Wildlife Foundation. $10,000.00
2010. Tamarisk and Fennel Treatment on the Whelan Ranch Habitat Conservation Area. Awarded by the Natural Resources Conservation Services - Wildlife Habitat Incentives Program (WHIP), $13,000.00
2011. Restoration of Coastal Sage Scrub Habitat on the Whelan Ranch Habitat Conservation Area. Awarded by the Partners for Fish and Wildlife Foundation. $5,000.00

Education
BS, Forestry and Natural Resources Management, Emphasis in Botany, California Polytechnic State University, 1998

Memberships
California Native Plant Society
California Invasive Plant Council
Southern California Botanists

Details by project

Botany

Botanical Surveys and Research Projects for the Manchester, Rancho La Costa, Wilmont and Morro Hills/Foss Lake, North County Habitat Bank (Encinas Creek), and Whelan Ranch Habitat Conservation Areas – The Center for Natural Lands Management, San Diego, California: Responsible for botanical surveys, inventories, mapping, monitoring and research on southern California Preserves. Responsible for monitoring and managing over fifteen threatened, endangered, or sensitive plant species.

Botanical Surveys for the San Felipe Valley Preserve – California Department of Fish and Game, San Diego, California: Surveyed for sensitive plants on approximately 14,000 acres of land under the jurisdiction of the California Department of Fish and Game. Three sensitive plants (*Caulanthus simulans, Delphinium parishii* var. *subglobosum,* and *Dudleya alaniae*) were located during survey effort.

Botanical Surveys for the Cocklebur Vernal Pool Complex - MCB Camp Pendleton, San Diego, California: Surveyed approximately 145 vernal pools associated with the Cocklebur Mesa Sensitive Area. Surveyed for sensitive plants and all vernal pool indicator plants. Sensitive plants located include *Brodiaea filifolia*, *Dudleya blochmaniae* ssp. *blochmaniae,* and *Eryngium pendletonensi*s.

Sensitive Plant Demographic Study, Domenigoni Valley Reservoir Project – Wagner Biological Consulting-Hemet, California: Monitored populations of seven sensitive vernal pool plants within the Salt Creek Mitigation Parcel. Responsibilities included mapping populations, collecting and analyzing data, and preparing report. Plants located included *Atriplex coronata* var. *notatior*, *Atriplex parishii*, *Centromadia pugens* ssp. *laevis*, *Lasthenia glabrata* var. *coulteri, Hordeum intercedens*, *Myosurus mimimus* ssp. *apus,* and *Navarretia fossalis*.

Botanical Surveys and Biological Assessment/Evaluation, Southern California Edison - Four National Forests in Central California: Providing NEPA documentation for Southern California Edison operations and maintenance activities associated with hydroelectric facilities on four National Forests: San Bernardino, Inyo, Sequoia, and Sierra. Conducted surveys for sensitive plants on Sierra and Sequoia National Forests. Sensitive plants located include *Calyptridium pulchellum*, *Carpenteria californica*, *Delphinium purpusii*, *Lupinus citrinus* var. *citrinus*, *Mimulus gracilipes*, and *Wyethia elata*. Surveys for noxious weeds and plants of Native American concern also occurred on the Sierra National Forest. Assist with client and Forest Service coordination to ensure project success.

Botanical Surveys and Biological Report for the Viejo Substation Project, Southern California Edison - Mission Viejo, California: Botanist responsible for botanical surveys and completion of biological report. Sensitive plant species located includes *Calochortus weedii* var. *intermedius.* Assisted in the preparation of a People's Environmental Assessment discussing impacts to sensitive biological resources.

Botanical Surveys and NEPA/CEQA Documentation, California Department of Transportation - San Diego and Imperial Counties, California: Botanist responsible for botanical surveys and NEPA/CEQA documentation for 5 projects located on the Southern California coast and in the Sonoran Desert. Habitats surveyed included vernal pools, maritime succulent scrub, coastal sage scrub, chaparral, coastal and foothill riparian, native and non-native grasslands, creosote bush scrub, tamarisk scrub, alkali playa, and desert riparian. Approximately 17 sensitive plant species were detected during the survey effort.

Botanical Surveys for the Surprise Canyon Technical Report, Bureau of Land Management - Inyo County, California: Surveyed for sensitive plants and mapped vegetation in the Surprise Canyon Wilderness Corridor on lands administered by the Bureau of Land Management. Sensitive plant species located included *Dudleya saxosa* var. *saxosa* and *Enceliopsis covillei.* Prepared portions of the Affected Environment section for the Final Environmental Impact Statement.

Botanical and Vegetation Surveys, California Department of Transportation Mitigation Project - Salton Sea, California: Responsible for surveys to locate sensitive plant communities for the California Department of Transportation Highway 87 mitigation bank.

Botany Program Maintenance, BLM Projects - California: Botanist responsible for assisting, developing, and maintaining the botanical program for the Barstow Bureau of Land Management Office. Surveyed for approximately 30 Mojave Desert sensitive plant species including *Astragalus jaegerianus*, *Astragalus albens*, *Erigeron parishii*, *Eriogonum ovalifolium* var. *vineum*, *Eriophyllum mohavense*, *Grindelia fraxino-pratensis*, and *Nitrophila mohavensis*. Provided technical and general botanical and invasive species information/outreach for internal and external customers including web pages and informative handouts. Maintained desired conditions in Areas of Critical Environmental Concern (ACECs), Unusual Plant Assemblages (UPAs), through monitoring, evaluating resource conditions, and recommending corrective management actions.

Wildlife

Sensitive Wildlife Surveys for San Diego Habitat Conservation Areas – The Center for Natural Lands Management, San Diego, California: Responsible for conducting protocol level surveys for coastal California gnatcatcher (*Polioptila californica californica*) and protocol nest monitoring and presence/absence surveys for the least Bell's vireo (*Vireo bellii pusillus*) on southern California Preserves.

Bullfrog Control Program, Kinder Morgan Energy Partners, L.P- MCB Camp Pendleton: Assisted with development of program and fieldwork for control of bullfrogs in San Mateo Creek at Marine Corps Base Camp Pendleton for mitigation of impacts to the southwestern arroyo toad during construction of a pipeline. Sensitive species located during control program included southwestern arroyo toad, southwestern pond turtle, and California newt.

Sensitive Avian Surveys, Otay Water District Habitat Management Area, Otay Water District – Chula Vista: Assisted with surveys for least Bell's vireo and United States Fish and Wildlife protocol surveys for the coastal California gnatcatcher.

Sensitive Butterfly Surveys, Otay Water District Habitat Management Area, Otay Water District – Chula Vista: Assisted with United States Fish and Wildlife protocol surveys for the Quino checkerspot butterfly.

Qualified Desert Tortoise Biologist, Kramer Junction Pipeline Project - Western Mojave Desert, California: Performed duties as a qualified desert tortoise biologist approved by the Bureau of Land Management, the United States Fish and Wildlife Service, and the California Department of Fish and Game for the Kramer Junction Pipeline Project for Southern California Gas Company.

Listed/Sensitive Species Surveys - Mojave Desert, California: Natural resource specialist responsible for surveying for the desert tortoise, Mojave ground squirrel, and desert bighorn sheep. As a qualified tortoise biologist, accumulated over 1,000 hours of survey time for the desert tortoise.

Restoration Ecology/Planning

Coastal Sage Scrub and Native Grassland Restoration on San Diego Habitat Conservation Area Lands – The Center for Natural Lands Management, San Diego, California: Implementing, monitoring and maintaining coastal sage scrub and native grassland habitat restoration projects on the Rancho La Costa and Whelan Ranch Habitat Conservation Areas, totaling 30 acres.

Exotic Weed Control Program - MCB Camp Pendleton: Project manager for 1.2 million dollar project to organize all historical exotic weed treatment data collected on the MCB since 1996. Responsible for overseeing the creation of a spatially organized geodatabase that organized all data collected on the MCB since 1996. Oversaw the re-treatment efforts of a subcontractor responsible for controlling exotic weeds in an approximate 380-acre area located on the Santa Margarita River on MCB. Primary target weeds included *Arundo donax* and *Tamarix* spp. Prepared annual reports outlining and documenting all historical weed treatment data pertaining to many mitigation areas and conservation banks and summarized the results of these treatments as they related to regulatory permits obtained from the United States Army Corps of Engineers so that MCB could track their permit requirements by acreage treated over extended periods of time.

Santa Clara Arundo Removal Long Term Implementation Program Report, Ventura County Resources Conservation District - Ventura County, California: Prepared sections in the Long Term Implementation Program Report discussing and recommending numerous removal and treatment methodologies for *Arundo donax* and *Tamarix* spp. Discussed the pros, cons, cost, and effectiveness of each removal method.

Wildfire Erosion Control Report - MCB Camp Pendleton: Natural resource specialist responsible for surveys to identify erosion areas associated with the Gavilan and Camp Margarita Fires on MCB Camp Pendleton. Assisted with the design and monitoring of erosion control measures/best management practices. Prepared the erosion control implementation report discussing site conditions, erosion potential using GIS modelling technology, and implementation of erosion control measures. Presented the project using Microsoft Powerpoint to the San Diego Fire Recovery Network.

Cannon Road Riparian Mitigation and Monitoring - City of Carlsbad, California: Project and budget manager for a wetland mitigation site established to offset road-widening impacts for the City of Carlsbad. Botanist responsible for horticultural and quantitative botanical surveys, reporting, and recommending corrective actions at a wetland mitigation site for the City of Carlsbad.

Kit Carson Coastal Sage Scrub Mitigation - City of Escondido, California: Project manager for a 22-acre coastal sage scrub and 11.5-acre riparian mitigation site established to offset golf course construction impacts and road-widening impacts for the City of Escondido. Botanist responsible for horticultural and quantitative botanical surveys, reporting, and recommending corrective actions at the mitigation site for the City of Escondido. Managed to successfully receive regulatory agency permit sign-off for the coastal sage scrub portion of the mitigation site.

Riparian Restoration and Riparian Proper Functioning Assessment, BLM Projects - Mojave Desert, California: Natural resource specialist responsible for performing and assisting in upland and riparian habitat rehabilitation projects, specifically weed control and riparian restoration. Assisted with monitoring and removing weeds in the Amargosa and Mojave rivers and upland desert restoration of OHV trails and burned areas.

Wetland Delineation

Buena Vista Creek Ecological Reserve, California Department of Fish and Game – Oceanside, California; Conducted a jurisdictional delineation of wetlands on a portion of the Reserve. Identified jurisdictional and non-jurisdiction wetlands on the Reserve and met with Regulatory Agencies to discuss restoration options of degraded habitat.

Kip Nursery Wetland Delineation, Southern California Edison - Huntington Beach, California; Conducted a jurisdictional delineation of wetlands and mapping of waters of the U.S.

Otay Water District Recycled Water Pipeline, Lee & Ro, Inc. - Chula Vista, California: Conducted a jurisdictional delineation of wetlands and mapping of waters of the U.S. Prepared documentation to obtain a Section 404 Corps' Nationwide Permit, a Section 401 water quality certification, and a Section 1600 streambed alteration agreement for the project.

Federal Law and Regulation Compliance

Environmental Assessments, Biological Evaluations/Assessments/Environmental Impact Statements/Reports, Categorical Exclusions/Exemptions, Section 7/10 Consultations, Various Projects - California: Prepared and assisted in the preparation of numerous documents to comply with regulatory agency laws, policies, and guidelines.

Field Assessments and Biological Assessments, BLM Projects - Mojave Desert, California: Specialist responsible for completing field inventories and preparing soil, water, plant and wildlife biological assessments in support of finalizing NEPA and ESA requirements on land use activities, (rights-of-way, mineral extractions, recreational activities, range projects). Provided technical review of biological assessments and environmental assessments submitted to the Bureau by private contractors and internal staff. Reviewed proposed actions for compliance under NEPA and ESA.

Formal and Informal Consultation with Regulatory Agencies Regarding Listed Species, BLM Projects - Mojave Desert, California: Specialist responsible for conducting formal and informal Section 7 consultations with the United States Fish and Wildlife Service and conference with the California Department of Fish and Game for listed plant and wildlife species in support of ESA requirements in relation to all land use activities.

Rangeland Health Assessments, BLM Projects - Mojave Desert, California: Lead botanist responsible for conducting rangeland health assessments, making determinations, and recommending corrective rehabilitative management actions in an interdisciplinary team setting. Educated and provided guidance regarding the Public Rangeland Health Standards and Guidelines to internal staff, external interested public, and external agencies through outreach meetings and training sessions. Prepared approximately 16 Rangeland Grazing Environmental Assessments and two Environmental Impact Statements.

Off Highway Vehicle (OHV) Assessments, BLM Projects - Mojave Desert, California: Natural resource specialist responsible for off-highway vehicle assessments, made determinations, and recommended corrective rehabilitative management actions in an interdisciplinary team setting for off-highway vehicle open areas in the Barstow Resource Area. Educated and provided guidance regarding the Public Rangeland Health Standards and Guidelines to internal staff, external interested public, and external agencies through outreach meetings and training sessions.